

Blythe Bridge,
Stafford,

Flood Risk Assessment & Drainage Strategy

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Client
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REPORT STATUS

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1 Introduction

This Flood Risk Assessment has been prepared on behalf of St Modwen, in support of Planning Application for the proposed residential development in Stafford.

The proposed residential development is located between the A50 and A5210 (Uttoxeter Road) in Blythe Bridge, Staffordshire.

The site's approximate ordinance grid reference is E396568, N340507. A site location plan is included within appendix A, the total area of the site is approximately 5.53Ha.

The site is presently undeveloped and is soft landscaped with a residential estate to the north and further undeveloped soft landscaping to the east, south and west.

This assessment has been prepared following the guidance set out in National Planning Policy Framework (NPPF)¹ and Planning Practice Guidance (PPG)².

Further guidance has been obtained from:

- EA/DEFRA R&D document W5-74/A/TR/1 "Preliminary rainfall runoff for new developments" Revision D, including figures 2.1 & 2.2.
- "Interim National Procedures" point 3, 10.2 & 10.3
- The SUDS Manual v.2. (ciria c753, Nov 2015)
- "Interim Code of Practice for Sustainable Drainage Systems 2004" (ICOP SUDS)

¹ National Planning Policy Framework, March 2012, Department for Communities & Local Government

² Planning Practice Guidance, March 2014 Department for Communities & Local Government

2 Existing Site

2.1 Site Location and Receiving Watercourse / River

The site is approximately 5.53Ha is soft landscaped and covered in grass. The site under consideration does not benefit from any known formal land drainage system and surface water is believed to percolate naturally into the ground. There is ordinary watercourse to the West of the site that is believed to be for highway drainage. The River Blithe runs approximately 500m off the south western boundary across the A50 and beyond the railway. Surface water runoff flows overland and through both piped and open ditch / watercourse land drainage systems. Flows pass under the A50 in a 900mm diameter culvert.

2.2 Topography

The topography of the existing site is such that there is a general fall from the north east towards the south west of the site, there is a gradient of approximately 1 in 48 over 336m distance with levels varying from 177.000m to 170.000m. A copy of the topographical survey drawing is included within appendix A.

2.3 Description of Catchment

From investigation of the Environment Agency floodplain maps it appears that the existing and proposed site area is not within a recognised floodplain area and such is categorised as being in a Flood Zone 1 area. A copy of the floodplain map is included within appendix A.

Also, the site is not at risk of surface water flooding as risk probability ranges from very low to low (1 in 1000 (0.1%) and 1 in 100 (1%)).

The site is not at risk from failure of any local reservoir. A reservoir flood map is included within Appendix A

2.4 Geology

e3p have carried out intrusive survey works at the site in August 2018. The works included are series of cable percussive borehole tests and machine dug trial pitting at various key locations over the proposed development site.

Extracts of the borehole investigation logs are included within appendix D of this report which give a full breakdown of soils encountered across the site.

Soil infiltration soakaway tests were also carried out, see results within appendix D. The test results confirmed that very little infiltration was observed and calculated rates represent moderate to poor infiltration. The underlying nature lithology exhibits a notable cohesive content , therefore reducing the effective permeability of the soils, as such the Site Investigation report recommends that soakaway drainage techniques are unlikely to be a suitable form of drainage for this site.

Groundwater was only encountered within WS103 at 1.2m bgl.

The presence of a strata of firm CLAY underlain by Lias / Charmouth Mudstone Formation would normally rule out the use of soakaway drainage that discharges directly into the ground.

The presents of cohesive strata would normally rule out the use of soakaway, however, there is still the opportunity to consider other SUDS measures which are discussed in more detail later on in this report.

3 Proposed Site

3.1 Description of development

The current proposed planning application is to develop the existing site into a 123 ** dwelling site with associated garages, adoptable spine roads and private roads.

The proposed development boundary area is approximately 5.53 hectares. The new development layout proposes a new hard landscaped impermeable area of approximately 2.875 Ha (50% of the proposed site area). Refer to the proposed development layout drawing and proposed impermeable areas plan in the appendix B. It is intended that private car parking will be permeable paving (tanked / lined) .

The proposed site levels have been set such that they try to (where possible) follow the contours of the existing site so as to minimise the requirement for any retaining walls and also adhere to highway design standards. Refer to drawing 12629 / 300 & 301 within Appendix B, for proposed levels and drainage respectively.

Proposed development levels will also be set such that they try to minimise any surface water flooding from the new development drainage network and ensure that should any flooding occur it is controlled and kept on site.

In addition to this development levels will need to respect any future earthworks operations to try and balance cut and fill quantities. This will help to minimise carting-off material from the site.

*** Full planning permission was granted on 12th May 2020 for the development of 146 dwellings, access and internal roads for vehicles, pedestrian and cycle linkages; car and cycle parking; associated play and open space, landscaping, ecological habitats; sustainable drainage measures, earthworks and all ancillary enabling works including the demolition of building and structures on Phase 1 of the residential development on the land allocated under Policy DSR1: Blythe Vale in the adopted Staffordshire Moorlands Local Plan (Application Ref. SMD/2018/0790).*

The above referenced permission was later amended by way of an application submitted under the provisions of Section 96a of The Town and Country Planning Act 1990, which was approved on 17th April 2023 (Application Ref. NMA/2022/0014). The Section 96a application sought approval for a revised Proposed Site Plan, which removed 23no. residential dwellings that were no longer intended to be delivered under SMD/2018/0790 and reduced the application red line boundary accordingly. The application also sought approval to amend the description of development to ensure consistency with the revised proposals by referring to 123, rather than 146 dwellings.

A separate full planning application which sought approval for a development of 11no. residential dwellings (Use Class C3) and associated works comprising internal access roads, parking, and hard and soft landscaping, in place of the 23no. residential dwellings that had previously been approved under SMD/2018/0790, was subsequently approved, subject to conditions, on 25 April 2023 (Application ref. SMD/2021/0370).

As a result of the above applications, a total of 134 dwellings have been delivered on Phase 1 of the residential development on the land allocated under Policy DSR1: Blythe Vale in the adopted Staffordshire Moorlands Local Plan.

4 Drainage Strategy

4.1 Existing Drainage

Based on available information it is understood that the development is currently not positively drained and as such any rainfall permeates naturally into the ground over the course of any rainfall event. During recent times there have been no reported incidents of any surface water flooding at the development site.

There are no drainage spurs from adjoining carriageways into the development site.

4.2 Proposed Foul Water Drainage Strategy

There is an existing foul sewer which is located approximately 420m east of the front of the site. The invert level of the existing foul sewer is at a suitable level to allow for a gravity connection and therefore a pumping station is not required.

Peter Brett Associated Engineering have previously produced a flood risk assessment which included a Severn Trent Water developers enquiry which is located within appendix E. Severn Trent Water have procured a Sewer Capacity Assessment on the exiting sewer network, within the assessment future flows were tested against the downstream network to assess any potential flooding issues that may have risen from the additional flows.

The completed Sewer Capacity Assessment indicates that no flooding occurs from the additional foul water flows. The full assessment is included within appendix E.

4.3 Proposed Surface Water Drainage Strategy

A site specific Flood Risk Assessment was carried out/approved by Peter Brett Associates back in September 2017 and it is proposed that the general recommendation of this report for future developments are adopted within the drainage strategy put forward for this development.

It is proposed that the surface water from the site will be discharged into the existing watercourse at the south east of the proposed site. This watercourse is believed to be culverted underneath the A50 and flows in a south west direction into the River Blithe. The resultant flow from the proposed development will be restricted to green field rates at 1 in 1, 30 and 100 year plus climate change storm events. To achieve this, a complex flow control device such as a vortex control will be introduced.

A schematic drainage strategy and anticipated attenuation volumes are indicated on drawing 12629 / 301 within appendix B.

Storm Period	Site Area	IPC SuDS Runoff (l/s)	5 l/s/hA
1 Year	5.53	24.8	27.65
30 Year	5.53	58.5	27.65
100 Year	5.53	76.7	27.65

It is anticipated that development flows will be restricted to 5 l/s/hA. With a site boundary of 5.53 that equates to a discharge rate of 27.65 l/s under all rainfall return periods.

Based on the above maximum discharge rate and an assumed developed site impermeability of 45% (approximately 3.04Ha hard standing) the required attenuation volume, based on Microdrainage quick storage estimates, would be as follows for the site area:

Storm Period	5 l/s/hA
1 Year	194-356 m ³
30 Year	691-1043 m ³
100 Year + 30%	1410-2022 m ³

As part of the Phase 1 works, it is proposed that the phase 2 attenuation is constructed. It is anticipated that the total phase 2 area is 10.49hA. Based on the impermeable area from Phase 1 (50%) the total drainage area for phase 2 can be estimated as 5.245hA.

In line with the phase 1 drainage strategy of 5 l/s/hA and an assumed site boundary of 10.49, this equates to a discharge rate of 52.45 l/s. Based on the discharge rate calculated and a assumed impermeability of 50% (5.245hA permeable area) the required attenuation volume, based on Microdrainage quick storage estimates, would be as follows for the site area:

Storm Period	Attenuation Volume Required
1 Year	271 - 496 m ³
30 Year	983 - 1511 m ³
100 Year + 30%	2051 - 2959 m ³

4.4 Design Analysis

We have carried out a full suite of storm simulations and for different return periods and durations and these are all appended to this report.

The storm return periods that have been simulated are:

1 in 1 year

1 in 30 year

1 in 100 year + 30% for climate change

Duration tested ranged between:

15 minutes through to 10080 minutes for both the winter and summer profiles.

The simulation results show that the design is compliant with the criteria set out in the drainage design summary in section 4.3. i.e. : no flooding is observed at the site from the 1 in 1 year or 1 in 30 year return period.

A nominal level of flooding is 66m³ was observed through the range of critical storm durations for the 100 year plus climate change event. This will be contained within the soft landscaping given the proposed levels that have been set.

The critical storm event was noted as being:

960 minute winter duration for the 1 in 100 year plus climate change storm.

Supporting calculations are included within appendix C.

4.5 PROPOSED SUDS MEASURES – SUMMARY

4.5.1 Allowable Surface Flooding

Additional storage of peak storm water can be facilitated by allowing low points away from dwellings to flood 100, the flooded volume will not put the buildings, or neighbouring properties at risk of flooding. The proposed site levels should be set such that this is achieved, for the critical 1 in 100 year plus climate change storm event.

4.5.2 Oversized Pipes

Surface water oversized pipes have also been considered within the plot drainage strategies and will provide an effective means of underground storage volume.

4.5.3 Surface Water Controls

Surface water controls are to be incorporated into the plot drainage systems to limit discharge rates to the previously prescribed values. These may take the form of vortex (Hydrobrake) or orifice plate controls.

4.5.4 Pond

An open pond feature located south east of the site has been proposed to attenuate the discharge of storm water.

4.5.5 Maintenance

General Maintenance and Management

The complete drainage system will have a detailed maintenance regime in place prior to occupation of the proposed new building. This regime will involve an inspection after 3 and 6 months, and any maintenance required will be carried out.

Further inspections will be carried out after 12 months, after which the maintenance schedule will be reviewed and adjusted to suit the circumstances and maintenance requirements of the development.

In any case following severe storm events, the system will be inspected to ensure that all elements are performing satisfactory.

Prior to occupation the new users of the building will be briefed on the operational and maintenance requirements of the drainage system so that they can ensure they are effectively implemented.

External Block Paved Areas Maintenance

Periodic inspections to be carried out once every six months of the proposed new blocked paved areas. The inspection will note whether sand / grit infill to the block paving units has been washed out, and caused units to become loose.

If this is seen then the fine sand is to be brushed back into the joints as required.

Surface Water Linear Drainage Channels maintenance

The new surface water linear drainage channels should only require limited maintenance as they are designed to be self-cleansing.

The units come with integral access points that can be opened if cleaning out of silts and debris is required from the channel. This can be done via a jetting operation, ensuring

silts are not washed down the downstream off site network. A mechanical sucker can be used to assist in this operation.

Other periodic maintenance may be required in the form of a routine sweep of the channel inlets to keep them clear of leaves and general debris.

Adoption, Access and Maintenance

We confirm the proposed new on plot drainage system will remain private and not be adopted, therefore access to this new SUDS system will not be required by any public body or statutory undertaker.

5 Flood Risk Assessment

5.1 Existing Information on Flood Risk

5.1.1 Tidal/Coastal

Coastal flooding is not considered a risk at this development with the nearest coastline being approximately 80 kilometres away.

5.1.2 Groundwater

Geological records indicated that the site is underlain by the Upper Permian formation of clays and mudstone. From this information we can consider the formation to be general low permeability but the site is undulating and so it is anticipated that perched groundwater will be present in localised low lying areas. The source of this groundwater is likely to be from localised infiltration. It is considered that the groundwater flows underlying the site will not be significant.

The risk of ground water flooding is to be mitigated in the design of the earthworks and the provision of land drainage to all embankments. The land drainage is to discharge into SUDS features or the main drainage network.

5.1.3 Surface Water

The site is not at significant risk of pluvial runoff flowing onto it over site boundaries, but the phased nature of developments and undulating landform is such that a risk may arise while the development is partially complete.

In addition, there are several features on the site that indicate the presence of land drainage. In the event that the existing systems of land drainage are exceeded, flooding of the site would present in localised low areas by the pluvial flooding mechanism.

As the whole site is proposed to be constructed in a number of phases over a number of years there is a risk of surface water flooding at down gradients between phases. This is to be mitigated by the provision of land drainage to all embankments. The land drainage is to discharge into SUDS features or the main drainage network.

5.1.4 Rivers / Watercourses / Fluvial

The River Blithe which flows in a south easterly direction approximately 500m of the sites south-western boundary. A review of the Staffordshire Moorlands SFRA has confirmed that there is no flooding in the 1000 year event within the site boundary, from the River

Blithe. The site is therefore considered to be at low risk of flooding from the River Blithe, and no mitigation measure are required.

The Environment Agency publishes floodplain maps on the internet (<http://www.environment-agency.gov.uk>). These maps show the possible extent of fluvial flooding for the 1 in 100-year flood (that which would have a 1% probability of being exceeded each year) or the possible extent of tidal flooding to a 1 in 200 year event. A plan showing the extent of the flooding along the nearest marked Environment Agency marked watercourse is presented in the appendix A.

This plan shows that the development under consideration does not lie within an area of a recognised floodplain and as such is categorised as flood zone 1 – low risk of flooding.

5.1.5 History of Flooding

Maps presented in the Staffordshire Moorlands Level 1 SFRA show that there is no historic flooding documented.

6 Summary

Baynham Meikle Partnership has prepared this Flood Risk Assessment following the guidelines set out in National Planning Policy Framework (NPPF) ¹ and Planning Practice Guidance (PPG) ², to support the Industrial Development at Plots 6200 Gloucester Business Park.

The Flood Risk Assessment may be summarised as follows:

- The Flood Maps have shown that the site is not identified to be at risk from fluvial flooding and does not form part of the functional floodplain.
- The proposed development will not generate any extra flow and will not exacerbate any flooding that may already occur within the vicinity of the site.
- The surface water runoff from the development site will be controlled such that the overall flow from the existing network is no more than the previously prescribed discharge rates. This is to be achieved through flow attenuation and the use of SUDS techniques in the new design. The techniques proposed will include sub-surface storage in the way of oversized pipes, permeable paving and an attenuation basin with flow being controlled by the use of vortex controls (Hydrobrakes) and/or orifice plates.
- Low areas may possibly be allowed to temporarily flood by no more than 100mm in extreme storm events. Finished ground levels will be carefully considered and flood routing will be applied to ensure protection of proposed buildings and of adjacent landowners, in the event of extreme conditions.
- The water quality will also be improved through the use of SUDS drainage techniques such as permeable paving.

It can therefore be said that the proposed development drainage schemes will be designed such that there is no increase to the potential of any flooding occurring at the site. This is mainly due to the peak runoff flows from the site being restricted to previously agreed rates for the site and adoption of recommended SUDS design techniques in line with the EA and CIRIA guidance.

APPENDIX A – EXISTING DOCUMENTS

- 12629/SK300 TOPOGRAPHICAL SURVEY
- 12629/SK301 SITE LOCATION PLAN
- 12629/SK302 ENVIRONMENT AGENCY RIVERS AND SEA FLOODING
- 12629/SK303 ENVIRONMENT AGENCY SURFACE WATER FLOODING
- 12629/SK304 ENVIRONMENT AGENCY RESERVOIR FLOODING
- 12629/SK305 EXISTING PERMEABLE AREAS PLAN

APPENDIX B – PROPOSED PLANS

- 12629/300 PROPOSED LEVELS PLAN
- 12629/301 PROPOSED DRAINAGE PLAN
- 12629/SK306 PROPOSED PERMEABLE AREAS PLAN
- 12629/SK307 PROPOSED DRAINAGE AREAS PLAN
- 12629/SK308 PROPOSED FLOOD ROUTING PLAN

APPENDIX C – MICRODRAINAGE CALCULATIONS

- QUICK STORAGE ESTIMATES
- NETWORK DESIGN CALCULATIONS 1, 30, 100 YEAR + CC.

APPENDIX D – EXTRACTS FROM RECENT INVESTIGATION

- SITE INVESTIGATION LOCATION PLAN
- TRIAL PIT LOGS
- BORE HOLE
- SOAKAWAY TEST RESULTS

APPENDIX E – SEVERN TRENT WATER DEVELOPER SERVICES ENQUIRY

- FOUL WATER DEVELOPER SERVICES ENQUIRY – FROM PERVIOUS FRA