

Flood Risk & Drainage Assessment
November 2023
Version 3

Breach House
Land south west of Sutton Lane
Market Bosworth
Leicestershire
CV13 0AD

Adam Tarver

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EXECUTIVE SUMMARY

Site Area	c.7ha overall plot
Existing / Historic Use	Meadow pasture and existing agricultural barn.
Proposed Use	Residential + woodland, wildlife flower meadow and wetland habitat creation.
Flood Zone	<u>Indicative Risk for buildings:</u> Flood Zone 1 (Low Risk) <u>Assessed Risk:</u> Flood Zone 1 (Low Risk) <u>Residual Risk (accounting for mitigation):</u> Negligible
Groundwater Flooding	Low
Infrastructure Failure	<u>Indicative Risk:</u> Low
Overland Flow - Flooding	<u>Indicative Risk:</u> Low <u>Assessed Risk (inc. Mitigation):</u> Negligible
Sewer Flooding	Negligible
Change to Site Surface Finishings (Y/N)	Yes. Surface water management proposed in line with best practice for new development.
Infiltration Potential?	No. Precluded by impermeable soils.
Attenuation Storage Proposed	69m ³ . To be provided by a detention basin.
Potential Receptor for Surface Water Discharges	Local watercourses: Sutton Brook at Greenfield rates.
Climate Change Allowance	Drainage: 40% based on a development lifetime of 100 years (<i>Residential</i>).

1.0 INTRODUCTION

1.1 Background

- 1.1.1 Amber Planning Ltd. has been appointed by Mr. Adam Tarver to prepare a Flood Risk Assessment in support of a paragraph 80 application to provide a new family home of exemplar environmental and design quality on land south west of Sutton Lane, Market Bosworth, Leicestershire, CV13 0AD. The Market Bosworth area lies within the administrative remit of Hinckley & Bosworth Borough Council and Leicestershire County Council, the latter comprising the Lead Local Flood Authority.
- 1.1.2 Prior approval was granted in 2019 to convert an existing barn in the north western section of the wider land holding to residential use (planning ref 19/01217/CQGDO). A subsequent application was then submitted in 2020 (20/00588/FUL) for additional construction to the previously approved scheme. This new application supersedes both earlier submissions.
- 1.1.3 Reference to the Environment Agency (EA) online Flood Maps indicates the application area and all proposed built development to be situated within Flood Zone 1 (Low Risk). However the south western boundary is in close proximity to Flood Zone 3a (High Risk) for the adjacent Sutton Brook, Figure 001. A Flood Risk Assessment is therefore required to inform the development design, with flood resilience and management measures outlined to ensure that the dwelling and its occupants remain protected from flooding throughout the anticipated lifetime. Consideration of the impact of proposals on the rate and volume of surface water runoff generated is also required.
- 1.1.4 This assessment has been prepared in accordance with the National Planning Policy Framework (NPPF) and its Planning Practice Guidance (PPG). The requirements of the Environment Agency, Hinckley & Bosworth Borough Council and Leicestershire County Council have also been accounted for within this study.



Figure 001: Environment Agency Indicative Flood Map

1.2 Objectives

- 1.2.1 The objectives of the Flood Risk Assessment are to:
- Review national and local planning policy documents and identify any issues they raise, and which need to be addressed in relation to flooding and hydrology;
 - Review readily available information on flooding using data provided by the EA and, where available, the Strategic Flood Risk Assessment (SFRA);
 - Evaluate the background hydrology;
 - Assess the risks from all sources of flooding, including tidal and fluvial;

- Consider the surface water drainage requirement(s) accounting for potential impacts on pre-developed rates and volumes of surface water runoff; and
- Recommend mitigation and / or management measures required to prevent detrimental impacts to flooding or hydrology at the site or within downstream receptors. This to include consideration of opportunities for the incorporation of Sustainable Drainage Systems (SuDS).

1.2.2 Local development framework documents, as well as strategic policy and technical studies, have been reviewed as part of this study.

1.3 Confidentiality

1.3.1 Amber Planning has prepared this report solely for the use of The Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Amber Planning; a charge may be levied against such approval.

2.0 SOURCES OF INFORMATION

2.1 General

2.1.1 In preparing this assessment background information has been sought from the following sources:

- Communities and Local Government (Sept. 2023). National Planning Policy Framework;
- Communities and Local Government (*Living Document*). Planning Practice Guidance;
- UK Government Guidance (May 2022). Flood Risk Assessments: Climate Change Allowances¹;
- CIRIA (2015). C753: The SUDS Manual V.6;
- Hinckley & Bosworth Borough Council website, Planning Policy page²;
- Hinckley & Bosworth (2019): Strategic Flood Risk Assessment³;
- Leicestershire County Council LLFA: Local Flood Risk Management Strategy (2015);
- Environment Agency Flood Mapping⁴ and Site specific data request (Jan. 2023);
- British Geological Survey online mapping⁵;
- Centre for Ecology and Hydrology Flood Estimation Handbook (FEH) Web Service, hydrometric data⁶;
- OS Mapping data⁷; and
- Site Topographical Survey.

2.2 Planning Context - National Planning Policy

National Planning Policy Framework

2.2.1 The National Planning Policy Framework (NPPF) Section 14: *Meeting the Challenge of Climate Change, Flooding and Coastal Change*, and its Planning Policy Guidance (PPG) document provide guidance on the consideration of flood risk, drainage and water quality within development design. According to the NPPF:

2.2.2 'A site-specific flood risk assessment is required for:

- All development within Flood Zones 2 (Medium Risk) and 3 (High Risk);

In Flood Zone 1, an assessment should accompany all proposals involving:

- Sites of 1ha or more;
- Land identified by the Environment Agency as having critical drainage problems;
- Land identified in a Strategic Flood Risk Assessment as being at increased flood risk in future; or
- Land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.'

2.2.3 Paragraph 167 of the NPPF states the following regarding the consideration of flood risk within the planning application process:

'When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood risk assessment. Development should

¹ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#table-2>

² https://www.hinckley-bosworth.gov.uk/planning_policy

³ https://www.hinckley-bosworth.gov.uk/downloads/file/6551/strategic_flood_risk_assessment_sfra_2019_main_report

⁴ <http://www.Gov.uk>

⁵ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

⁶ <https://fehweb.ceh.ac.uk/GB/map>

⁷ www.promap.co.uk

only be allowed in areas at risk of flooding where, in light of this assessment (and the sequential and exceptions tests, as applicable), it can be demonstrated that:

- a) *Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) *The development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) *It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) *Any residual risk can be safely managed; and*
- e) *Safe access and escape routes are included, where appropriate, as part of an agreed emergency plan.*

2.3 Planning Context - Local Planning Policy

Hinckley & Bosworth Borough Council Local Plan

- 2.3.1 Hinckley & Bosworth Borough Council are currently working on a new Local Plan which will set out land allocations and planning policies for the period 2020-2041. The latest Local Development Scheme (LDS) was approved at Full Council in December 2022, with the updated LDS extending the Local Plan period from 2039 to 2041.
- 2.3.2 The current Local Plan, 2006 – 2026, includes the following development plan documents (DPDs):
- Core Strategy DPD (adopted 2009)
 - Site Allocations and Development Management Policies DPD (2016)
- 2.3.3 Policies within the current Site Allocations and Development Management Policies DPD relevant to the consideration of Flood Risk and Drainage are as follows:
- Policy DM7: Preventing Pollution and Flooding
 - Policy DM10: Development and Design
- 2.3.4 A draft of the new Local Plan, 2020 – 2041 (June 2021), due to be revised and sent to the Secretary of State in 2022, sets out a new list of Policies. The following policies from the new draft Local Plan are relevant to the consideration of Flood Risk and Drainage are:
- SS01: Sustainable Development
 - CC01: Mitigation and Adaptation to Climate Change
 - CC02: Flood Risk
 - CC03: Sustainable Drainage Systems
 - PMD01: High Quality Design
 - PMD03: Preventing Pollution
 - NAT11: Blue Infrastructure

Strategic Flood Risk Assessment

- 2.3.5 The Strategic Flood Risk Assessment (SFRA) report evaluates the extent and nature of flooding in the borough, it also considers the implications for land use planning and sets out the criteria for submitting future planning applications and guiding development control decisions.
- 2.3.6 This document has been reviewed as input to this study.

3.0 BACKGROUND AND DATA REVIEW

3.1 Site Setting

Property Address	Land south west of Sutton Lane, Market Bosworth, Leicestershire
National Grid Reference	440690, 301520
Area	c.0.5ha

Table 001: Site Setting

3.2 Current Layout

- 3.2.1 The proposed dwelling is situated within the south western part of the western most field. An existing agricultural barn, considered to be a non-designated local heritage asset, is present in the north west of the same field. Current access to the barn and wider land holding is via the north western corner adjacent to Sutton Lane. Sutton Lane is within the Applicant's ownership and comprises a gated road which is an old 'drovers way', once used for driving cattle to market.
- 3.2.2 The property sits within open countryside outside of the settlement boundary. The Sutton Brook flows in a generally westerly / north westerly direction along the south western boundary of the wider application area, Figures 002-004.

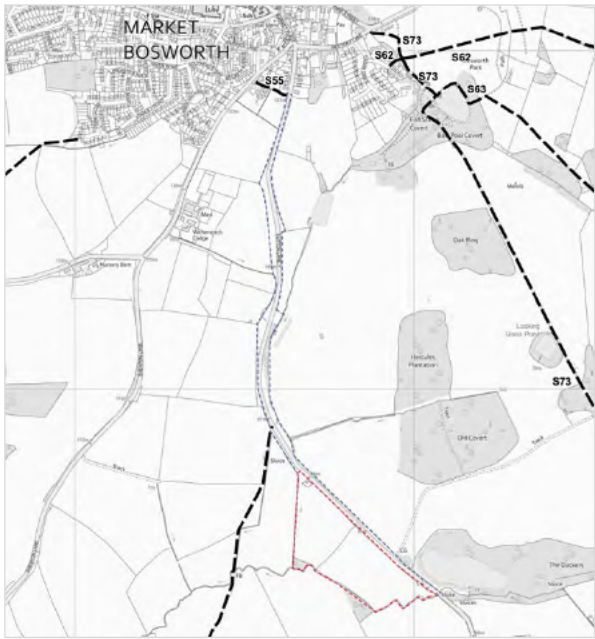


Figure 002: Site Location Plan



Figure 003: Existing Site Layout – Aerial Photo



Figure 004: Existing Site Plan

3.3 Surrounding Area

- 3.3.1 The application area is situated within a rural setting c.1.20km south of Market Bosworth and 1.25km north west of the village of Sutton Cheney. The local landscape is predominantly a mix of arable fields, grazing pastures and woodland blocks. The Sutton Brook forms the south western boundary of the wider land holding and Sutton Lane its north eastern boundary.

3.4 Proposed Development

- 3.4.1 A planning application is to be submitted for a paragraph 80, exemplar design, off-grid new family dwelling on land to the south west of Sutton Lane. The wider land holding consists of two fields and an existing barn. The proposed property will be situated in the south western section of the western most field.
- 3.4.2 The existing barn is to be regenerated to agricultural use and the two fields carefully utilised to accommodate the new 4 bed family home, energy generating water tower and car port. The development layout is summarised in Figure 005 and is shown in greater detail to the rear of this report. The wider land holding will be subject to ecological enhancement, through the input of woodland, a wildlife flower meadow, orchard, hedgerow restoration and wetland creation adjacent to the Sutton Brook.



Figure 005: Proposed Site Layout

3.5 Topographical Survey

- 3.5.1 Topographic Survey data, Drawing 22206-22-02: *Topographic Site Survey*, indicates surface elevations of between 93.0m AOD and 96.0m AOD in this locale. Highest ground levels are seen on the north western boundary adjacent to the existing barn, reducing towards the Sutton Brook where lowest ground levels are seen adjacent to the south western boundary.
- 3.5.2 Surface elevations in the area of the proposed dwelling are located between 93.20m AOD and 93.6m AOD. Levels are between 95.8m AOD and 96.0m AOD on Sutton Lane with greatest elevations adjacent to the existing barn in the area of the proposed new access.

3.6 Hydrogeology

- 3.6.1 Regional geological mapping indicates the bedrock geology to comprise the Gunthorpe Member – Mudstone. Superficial deposits of Alluvium (clay, silt, sand and gravel) adjacent to the Sutton Brook along the south western boundary of the wider application area.
- 3.6.2 No BGS borehole data is available within 1.5km. The nearest, SK40SW50, dates from June 1948 and is located 1.5km south east on the north eastern outskirts of Sutton Cheney. Here the Gunthorpe Member is overlain by glaciofluvial deposits. A resting groundwater level of 3.0m bgl is recorded.
- 3.6.3 A series of boreholes, including SK40SW40 and SK40SW41, is situated 1.6km north at Market Bosworth, Figure 006. These boreholes date from October 1983 and are associated with a school building. The Gunthorpe Mudstone in this vicinity is overlain by superficial glaciofluvial deposits. Slight water seepage is recorded in one borehole at 8.5m bgl; with the other noted as dry.
- 3.6.4 Defra's Magic website⁸ indicates the area to be external to Groundwater Source Protection Zones. This coupled with the plot's elevated position, significant depth to groundwater and the impermeable underlying geology, indicate the flood risk from groundwater sources to be Low. The presence of unimpeded flowpaths for the conveyance of extruded groundwater into local watercourses further reduces this risk, with no further assessment proposed.

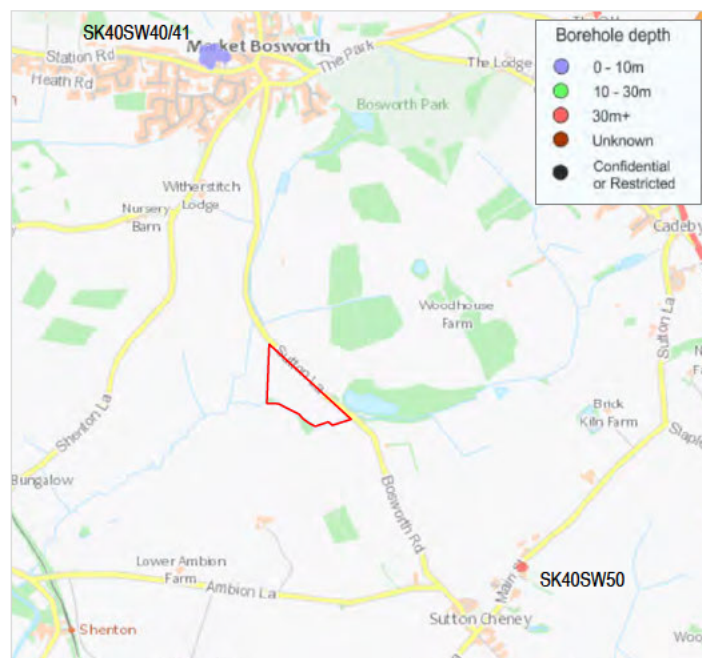


Figure 006: British Geological Survey Borehole Location Map

⁸ <https://magic.defra.gov.uk/MagicMap.aspx>

3.7 Fluvial Flooding and Hydrology

- 3.7.1 The south western boundary of the wider application area is formed by the Sutton Brook, with this part of the property indicated to be affected by Flood Zone 3 (High Risk). The remainder of the land holding, included the proposed area of the dwelling, is within Flood Zone 1 (Low Risk).
- 3.7.2 In the wider locale, many isolated ponds and large lakes form part of the historic Bosworth Estate.

Hydrological Data

Catchment Descriptor	Value
Area	4.38km ²
River Baseflow Index (BFIHOST 19)	0.428
Standard Percentage Runoff (SPRHOST)	41.32%
Drainage Path Length (DPLBAR)	2.12km
Drainage Path Slope (DPSBAR)	27.80m/km
Flood Attenuation by Rivers and Lakes (FARL)	0.921
Proportion of time soils are wet (PROPWET)	0.300
Standard Annual Average Rainfall (SAAR)	681mm
Urban Extent (URBEXT: 2000)	0.0069

Table 002: FEH Catchment Descriptor Information

- 3.7.3 Catchment descriptor information has been downloaded from the CEH Flood Estimation Handbook Web Service which is summarised in Table 002. This indicates a small, *essentially rural*, catchment with low topographical relief, largely permeable geology, and low average annual rainfall.
- 3.7.4 Flows within local watercourses are indicated to be generated equally by overland (SPRHOST) and subterranean flows (BFIHOST) with a moderate catchment response to incident rainfall anticipated. A low FARL value (Flood Attenuation by Rivers and Lakes) indicates attenuation to be present within the upper catchment which may depress the response to incident rainfall. The catchment response to rainfall may however be elevated by local factors, e.g. urban runoff and impermeable overlying soils.

Fluvial Flooding

- 3.7.5 Review of detailed Environment Agency Flood Mapping indicates the majority of the property to be within Flood Zone 1, with the south western boundary indicated to be affected by Flood Zone 3a, associated with the Sutton Brook.
- 3.7.6 The new dwelling is to be located c.35m north east of the Sutton Brook and c.40m south east of a drainage ditch present on the north western boundary. Topographical analysis of the flood outline indicates a flood level of c.93.18m AOD with the proposed dwelling situated 13.3m from the northern margins of the floodplain envelope and indicated to be unaffected by fluvial flooding.

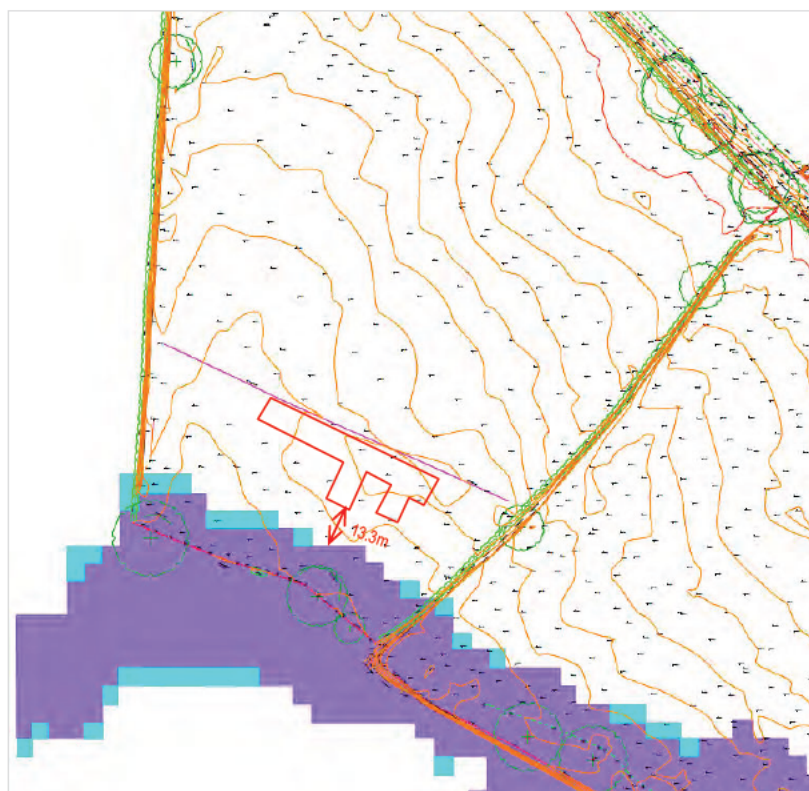


Figure 007: Flood Map for Planning (Site Specific)

3.8 Historic Flooding

- 3.8.1 Desk based investigation, including review of the Strategic Flood Risk Assessment and Defra Historic Flood Maps⁹, reveals no evidence of historic flooding in this locale, although there have been borough wide flood incidents in recent years. EA supplied data indicates there to be no record of historic flooding in this locale.
- 3.8.2 Caution should be exercised when reviewing historic flood records. This information is largely anecdotal and does not always include record of either the antecedent conditions giving rise to flooding (e.g. flood source), or reference to a flood return period. Furthermore, a lack of recorded incidents is no guarantee that an area has never flooded.

3.9 Flood Zone Classification

- 3.9.1 The proposed dwelling and its access are situated within Flood Zone 1 (Low Risk). The south western boundary adjacent to the Sutton Brook is indicated to be partially affected by Flood Zone 3 (High Risk).

3.10 Flood Risk Vulnerability

- 3.10.1 A planning application has been submitted for the construction of a paragraph 80, 4 bed family dwelling on land south west of Sutton Lane, Market Bosworth, Leicestershire. This includes a house (660m²), water tower and car port. Table 2 of the PPG defines residential use as '*More Vulnerable*'. Table 3 of the PPG considers this an appropriate use within Flood Zone 1.

⁹ <https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/HistoricFloodMap&Mode=spatial>

	Flood Risk Vulnerability Class'n (PPG Table 2)	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Flood Zone (PPG Table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	Exception Test Required	✓	✓	✓
	Zone 3a	Exception Test Required	x	Exception Test Required	✓	✓
	Zone 3b (Functional Floodplain)	Exception Test Required	x	x	x	✓

Key:

✓ Development is appropriate x Development should not be permitted

Table 003: PPG Table 3 – Flood Risk Vulnerability and Flood Zone Compatibility

3.11 NPPF Sequential and Exception Tests

- 3.11.1 The Sequential Test steers development preferentially towards Flood Zone 1 (Low Risk), considering Flood Zone 2 (Medium Risk) and then Flood Zone 3 (High Risk) only if land cannot be identified as available for development in zones at lower risk from flooding. The property is located entirely within Flood Zone 1 and therefore fulfils the requirements of the Flood Risk Sequential Test by default.

3.12 Climate Change

Fluvial Allowances

- 3.12.1 The flood data supplied by the Environment Agency for this locale has been prepared using J-Flow modelling and therefore climate change allowances are unavailable. Government Guidance on Climate Change Allowances to Peak River Flow Allowances (Table 2), requires application of climate change factors of up to 22% (Central Allowance) to 2115, based on a development lifetime of 100 years (residential use).
- 3.12.2 The property is indicated to be located within Flood Zone 1 and is situated 35m from the watercourse and 13.3m from the outer margins of the floodplain envelope. It is therefore considered highly unlikely that it would be affected by fluvial flooding within the development lifetime even accounting for climate change. Nevertheless flood mitigation is specified within the design to minimise residual risks posed by fluvial flooding.

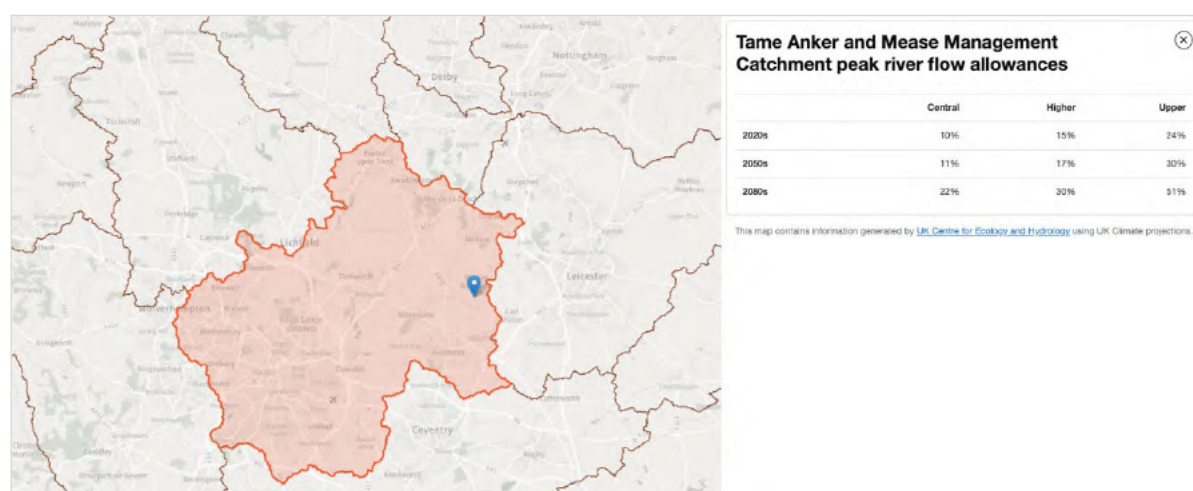


Figure 008: Climate Change Allowances – River Flow

Rainfall Allowance

- 3.12.3 Government Guidance on Climate Change Allowances to Peak Rainfall Intensity (Table 2), requires application of climate change factors of up to 40% (Upper End) to 2115, based on a development lifetime of 100 years (residential use).

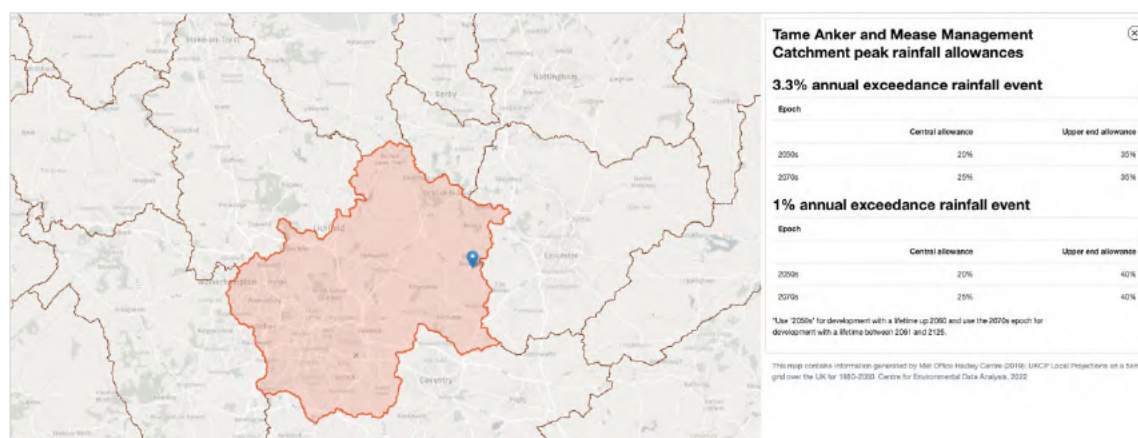


Figure 009: Climate Change Allowances – Rainfall Intensity

3.13 Infrastructure Failure

- 3.13.1 Flooding from artificial sources occurs when man made infrastructure, e.g. flood defences, raised channels or surface water storage features (e.g. reservoirs), becomes overwhelmed leading to breach or failure of the dam, banks or control structures. The probability of failure is low owing to regular inspection and maintenance regimes. However, in the event of a breach occurring, the consequences can be significant.
- 3.13.2 The application area is remote to raised waterways or flood defences the failure of which could lead to flooding. The flood risk posed by this form of infrastructure failure is therefore considered to be **Low** with no further assessment required.
- 3.13.3 Review of National Reservoir Flood Maps indicates the house to be unaffected by reservoir flooding under both normal and extreme river water level scenarios, with no further assessment required.

3.14 Surface Water Flooding

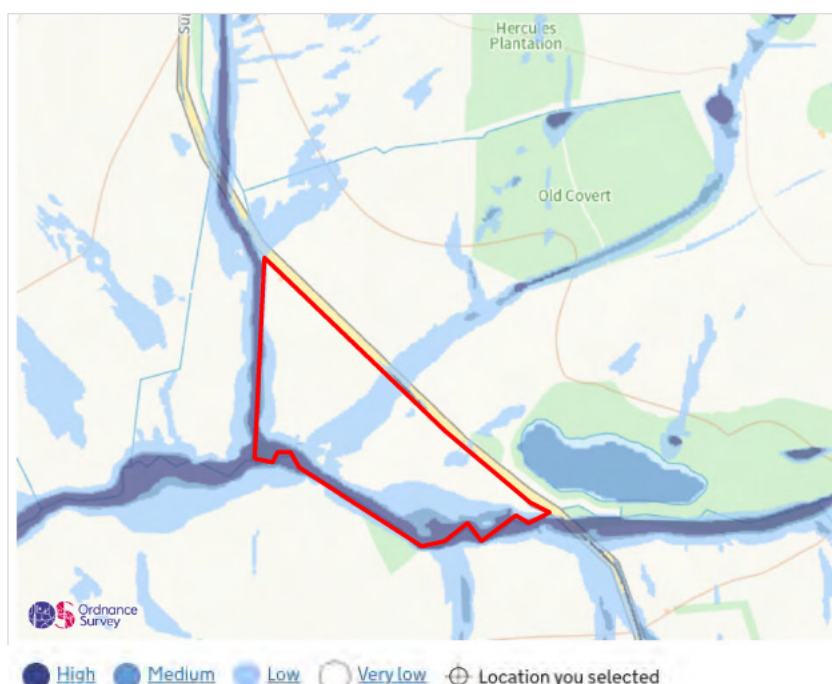


Figure 010: Environment Agency Surface Water Flood Map

- 3.14.1 Detailed EA pluvial mapping downloaded from the EA website, assesses three main scenarios, Low Risk (0.1%-1% probability of flooding annually), Medium Risk (3.3% - 1%) and High Risk (>3.3%). The findings of this assessment are summarised in Figure 010.
- 3.14.2 This data indicates the western and south western and south eastern boundaries of the wider application area to be at **Medium to High** risk of surface water flooding. A further area of **Low** risk pluvial flooding bisects the centre of the property with further assessment required.

3.15 Sewer Flooding

- 3.15.1 The property is located in a rural setting and is remote from surface water sewers with a **Negligible** associated flood risk and with no further assessment proposed.

4.0 FLOOD RISK ASSESSMENT

4.1 Flood Risk Screening Opinion

- 4.1.1 In accordance with the NPPF Section 14 it is necessary to consider all forms of flood risk. A flood risk scoping exercise has therefore been completed, the results of which are outlined in Table 004.

Nature of Flood Risk	Flood Risk to Site?
Groundwater	No. Groundwater is indicated to be located at depth.
Tidal	No. Remote from tidal waters.
Fluvial	Low. Property is located in Flood Zone 1 and is situated >13m from the outer margins of the floodplain envelope for the Sutton Brook.
Infrastructure Failure (Reservoirs, Canals and Other Artificial Sources)	Raised Waterways: Not at risk. Flood Defence Breach / Failure: Not at risk. Reservoir Failure: Not at risk.
Overland Flow (surface water from off-site sources)	Yes. EA Flood Maps indicate the site to be at potential risk from surface water flooding, with further assessment required.
Sewers	No. The application area is remote from surface water sewerage infrastructure with a negligible associated flood risk and with no further assessment required.
Surface Water Drainage (on-site)	Yes. An uplift in impermeable surface will arise from development proposals. Consideration of surface water management is therefore required.

Table 004: Flood Risk Screening Opinion

- 4.1.2 Flood screening indicates the principal flood risk to arise from pluvial sources, with these duly assessed. The results are summarised below.

4.2 Surface Water Flooding

- 4.2.1 Detailed EA pluvial mapping downloaded from the EA website, assesses three main scenarios, **Low Risk** (0.1%-1% probability of flooding annually), **Medium Risk** (3.3%-1%) and **High Risk** (>3.3%). Review of this mapping indicates the wider application area to be affected by flooding arising from **Low** and **Medium Risk** scenarios (Figure 011).
- 4.2.2 The main flood mechanism appears to be associated ponding of water on the south eastern boundary along with surcharge of a drainage channel (north western boundary) and the Sutton Brook (south western margins of wider property).
- 4.2.3 The pluvial floodplain appears to mirror the fluvial floodplain with the main built footprint indicated to be unaffected. Furthermore, unimpeded flowpaths exist for floodwater to the south west of the property towards the Sutton Brook. Elevated water levels are likely to be limited to the period around peak flows, with these receding quickly once downstream water levels subside.
- 4.2.4 Nevertheless, given the proximity of the pluvial floodplain, it is recommended that flood resilience measures be included within the building design to minimise potential residual risks associated with both pluvial and fluvial flooding.



Figure 011: Environment Agency Detailed Surface Water Flood Map

4.3 Flood Mitigation and Management

- 4.3.1 The application area is situated c.35m north east of the Sutton Brook and is indicated to be unaffected by flooding for design return period fluvial or pluvial flooding for return period events up to and including 1000 years. Nevertheless, given the proximity of the development to the floodplain envelope, the following flood mitigation and management measures are recommended:

Flood Mitigation

- Raising of entry points for all services to a minimum of 600mm above the maximum flood level to ensure an emergency level of service is retained in the event of flooding, e.g. to 93.78m AOD; and
- Raising of finished floor levels to 600mm above the flood level, e.g. to 93.78m AOD.

Flood Management

- Sign up to the EA flood warning system¹⁰. This provides advance warning of flooding and would advise residents of the potential need to evacuate;
- The building itself will act as a point of safe refuge should flooding occur; and
- Residents are advised to familiarise themselves with the measures to be undertaken in the event of flooding, e.g. points of safe refuge, evacuation routes and isolation of services.

Safe Refuge and Access

- 4.3.2 In the instance that flooding was to occur, safe refuge exists within the proposed dwelling.
- 4.3.3 Safe access is achievable from the dwelling under full flood conditions, with the property and its access unaffected by flooding and with links with higher ground present immediately north east, surface elevations rising in a north easterly direction to 95m AOD adjacent to the proposed entrance onto Sutton Lane on the north eastern boundary. This road connects into the main arterial road network serving the area.
- 4.3.4 No further flood mitigation or management measures are recommended.

¹⁰ <https://www.gov.uk/sign-up-for-flood-warnings>

4.4 Summary of Flood Risk

- 4.4.1 In accordance with the requirements of the NPPF and local planning policy documents, all potential flood risks posed to / by the proposed new dwelling have been assessed, with the principal hazard identified to arise from pluvial sources, which has been duly assessed, with a **Low** flood hazard indicated.
- 4.4.2 Given the proximity of the property to the fluvial and pluvial floodplains, flood mitigation measures are specified to minimise identified residual risks accounting for both the development lifetime and flood risk vulnerability. Flood management is also proposed to alert residents to the risks posed by flooding and the actions to be taken should this occur. This includes consideration of flood warning and designation of points of safe refuge, as well as safe access / egress routes.
- 4.4.3 It is duly presented that the property and its occupants would be at **Low** risk from flooding throughout the anticipated development lifetime, ensuring the safety of its occupants throughout all periods of flooding, and with no detrimental impact on flood risk elsewhere.
- 4.4.4 The proposals are therefore considered appropriate within the context of the Local Planning Policy documents and paragraph 167 of the NPPF:
- *Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
 - *The development is appropriately flood resistant and resilient such that, in the event of a flood it could be quickly brought back into use without significant refurbishment;*
 - *It incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
 - *Any residual risk can be safely managed; and*
 - *Safe access and escape routes are included, where appropriate, as part of an agreed emergency plan.*
- 4.4.5 Potential impacts to flood risk arising from surface water generated by the development are addressed in Section 5.0.

5.0 SURFACE WATER

5.1 Introduction

- 5.1.1 A paragraph 80 application is sought, to provide a new 4x bed family home of exemplar environmental and design quality, consisting of two storey home, energy generating water tower, carport and associated landscaping and access on land south west of Sutton Lane, Market Bosworth, CV13 0AD.
- 5.1.2 The field currently drains via infiltration to ground, with excess runoff discharged via overland flow to local watercourses.
- 5.1.3 The NPPF and its PPG require that existing runoff rates be maintained, taking account of climate change and that, wherever possible, a degree of betterment is provided.
- 5.1.4 An uplift in impervious surface will arise from development proposals which, without mitigation, would have a consequent detrimental impact on the rate and volume of runoff generated. This would be further compounded by climate change impacts over time.
- 5.1.5 In accordance with the NPPF new development must incorporate flood attenuation measures sized to accommodate flows from impervious surfaces for return period pluvial flood events up to and including 100 years, taking account of climate change and with discharges restricted to greenfield rates. Water quality treatment is also required to mitigate potential detrimental impacts to downstream receptors, including groundwater and local watercourses.
- 5.1.6 The use of Sustainable Drainage Systems (SuDS) should be considered, wherever practicable.

5.2 Land Use

Land Use	Existing		Proposed	
	Area (m ²)	Runoff Coefficient	Area (m ²)	Runoff Coefficient
Built	0	0.95	660	0.95
Paving / Driveway	0	0.90	461	0.70
Water Features	0	1.00	150	1.00
Soft Landscaping	4,835	0.40	3,564	0.40
Total	4,835	0.40	4,835	0.52

Table 005: Summary of Land Use

5.3 SuDS Options for Surface Water Disposal

- 5.3.1 Desk based investigation indicates the presence of underlying clay soils. More permeable soils (sands and gravels) overly the clay soils immediately adjacent to the Sutton Brook, with limited potential for the use of infiltration as the primary means of surface water disposal.
- 5.3.2 The property is situated immediately north east of the Sutton Brook and a drainage channel to the north west, into which connections could be established for the discharge of runoff, with gravitational discharge demonstrated as feasible. No third party land is present between the proposed dwelling and the watercourse(s). This is the preferred method of surface water discharge. This will be supplemented by SuDS measures (where practicable) to maximise infiltration at source and limit off site discharges during minor rainfall events. This is in accordance with the SuDS hierarchy as outlined within Section 3.2.3 of the SuDS Manual, and summarised below:

SuDS Discharge Hierarchy:

- Infiltration
- Discharge to surface waters
- Discharge to surface water sewer
- Discharge to combined sewer (Last Resort)

5.4 Surface Water Discharge Rates

- 5.4.1 Existing runoff rates have been estimated using the WinDes Micro drainage ICPSUDS function, with input data from the Flood Estimation Handbook web service and based on linear interpolation from a 50ha catchment, in accordance with SUDS Manual guidance. Table 006 summarises the results of this analysis. Full copies of these calculations are located at Appendix II: *Workings*.

Return Period (yrs.)	Runoff Rate (l/s/ha)	Runoff Rate (l/s)
Q_{BAR}	4.306	0.547
30	10.314	1.311
100	15.238	1.937

Table 006: Greenfield Runoff Rates * Based on a 1,271m² Impermeable Area

5.5 Attenuation and Controlled Discharge

- 5.5.1 The WinDes Micro Drainage software package has been used to estimate the surface water attenuation requirements for the proposed development. Storm scenarios were run for both winter and summer profiles, for a range of durations between 15-10,080 minutes, taking account of land use data, infiltration rates / greenfield runoff rates and climate change, respectively. Copies of these calculations are contained within Appendix II and are summarised in Table 007.
- 5.5.2 The WinDes Micro Drainage package assumes all land surface to be impermeable. Therefore, where the runoff coefficient differs (e.g. permeable paving / surfaces) the total contributing area has been multiplied by the runoff coefficient to establish a 1,132m² 'Effective Impermeable Area' for assessment. Impermeable surfaces are accounted for at 100%.

Results

Return Period Rainfall Event (Yrs.)	Required Storage (m ³)
Q_{BAR} Urban	29
30	54
100	69

Table 007: Surface Water Attenuation Requirements

5.6 Drainage Layout

- 5.6.1 A maximum rainwater storage requirement of 69m³ has been estimated. This will be provided by an attenuation pond situated on the south eastern boundary and sized to accommodate runoff for return period events up to and including the 100 year storm, without surcharge and accounting for climate change at 40%. Refer to Drawings H8495-002: Conceptual Drainage Layout and S31 22199 D04: Presentation Design 15 - Pond Area, for a graphical representation of the SuDS Strategy. The following design considerations have been assumed:
- Depth: 0.80m
 - Area (Top of Bank): 235.0m² (23.5m x 10.0m); (Base): 97.3m² (18.7m x 5.2m)
 - Volume: 69m³
 - Max. Water Level: <0.5m
 - Bank Slope: 1:3
 - Freeboard: >300mm
 - Discharge: Local watercourse
- 5.6.2 A dual outfall arrangement is proposed, with a low level outfall to discharge at lower rates under standard conditions, and a high level offtake to release runoff at higher rates under flood conditions. Discharge from both outfalls will be controlled by a restricted orifice fitted with a flow control slot and / or flap valve, to ensure existing (greenfield) runoff rates are maintained, and to reduce the likelihood of blockage leading to surcharge.
- 5.6.3 This configuration will promote infiltration to ground, where practicable, with excess water discharged via gravity to local watercourses at controlled (*greenfield*) rates.

5.7 Network Capacity

Driveway

- 5.7.1 Runoff from the driveway will be intercepted at source and drained to permeable pavements with underlying porous sub-base. A 6m standoff from all built development is incorporated within the design to prevent potential detrimental impacts to structural stability and human health (rising damp). A drainage blanket at the base of the porous paving will direct runoff to the southern edge of the driveway where it will be collected by a filter drain and directed into the detention basin via a minor swale.

House / Patio

- 5.7.2 Surface contouring will be used to direct runoff from the house and patio into a minor swale and / or filter drain(s) for onward conveyance into the main surface water storage area (detention basin).
- 5.7.3 Piped drainage networks, where present, are designed to convey runoff for return period storms up to and including 100 years, accounting for climate change, and without surcharge, for all duration rainfall events, accounting for the 15 minute storm.
- 5.7.4 The surface water attenuation facility is designed to be dry under normal conditions becoming operational only following intense rainfall or storm activity. Capacity is present to accommodate rainfall events up to and including the 100 year storm, accounting for climate change and without surcharge.
- 5.7.5 Flood exceedance routes are incorporated within the design to direct runoff into the attenuation facility via overland flowpaths where blockage or surcharge of the drainage networks occurs. This may comprise low level kerbing / rough finishes or a filter drain and underlying permeable pipework to retain / intercept runoff and direct it towards the attenuation area via overland flow.
- 5.7.6 Perimeter drainage will be installed at the property boundary to intercept excess runoff and direct it back into the on-site drainage networks, preventing the uncontrolled release of runoff to third party land.
- 5.7.7 The incorporation of SuDS measures will promote the interception and infiltration of surface water at source and limit off-site discharges under general / low flow conditions.
- 5.7.8 Given the underlying (bedrock) clay geology and depth to groundwater it is anticipated that the surface water management

systems will not suffer impacts to efficiency arising from groundwater ingress. Further, it is considered that the requisite 1m separation distance between the base of the detention facility and underlying groundwater will be achieved, accounting for seasonal variations in groundwater levels.

- 5.7.9 Care has been taken to situate the surface water attenuation measures outside of the fluvial floodplain to prevent impacts to efficiency arising from fluvial flooding or pluvial flows generated by off-site areas.

5.8 First Flush Areas

- 5.8.1 In line with best practise, first flush storage is required to accept the first 5mm of rainfall from impervious surfaces and infiltrate it into the surrounding topsoil. This to reduce off-site surface water discharges during minor rainfall events.
- 5.8.2 A total first flush storage requirement of 5.66m³ is estimated based on an effective impermeable area of 1,132m². It is anticipated that this would be easily accommodated by the on-site SUDS measures which would promote the interception and infiltration of runoff at source and limit off-site discharges under general / low flow conditions.
- 5.8.3 This will be further bolstered through the provision of water butts to collect rainwater for re-use in watering gardens and reduce reliance on the potable supply for non-potable uses. Typical water butts store between 100-200 litres, it is therefore recommended that a minimum of 2 water butts be installed, with these ideally >150 litres volume. Whilst for flood attenuation purposes it must be assumed that the butt(s) are full, this would nevertheless reduce the rate and volume of runoff during minor rainfall events.

5.9 Water Quality

- 5.9.1 The surface water drainage system incorporates SuDS elements designed in accordance with the SuDS Manual (CIRIA report no. C753). These are specified to provide on-site water quality treatment, taking account of the Pollution Hazard and Mitigation Indices outlined within Tables 26.2 and 26.3 of the SuDS Manual, respectively; with these summarised in Tables 008 and 009.
- 5.9.2 Review of this data indicates the Pollution Hazard Indices for all identified contaminants to be lower than the Mitigation Indices for at least one of the individual SuDS components, refer to Tables 008 & 009. It is therefore concluded that the proposed SuDS Mitigation measures outlined in Table 009, and expanded on below, are sufficient to mitigate potential contaminants present within site generated runoff.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very Low	0.20	0.20	0.05
Property driveways, residential car parks, low traffic roads (home zone / access roads)	Low	0.50	0.40	0.40

Table 008: Excerpt from CIRIA 753 Table 26.2 Pollution Hazard Indices for Different Land Use Classifications

SuDS Mitigation Indices			
SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Filter Drain	0.4	0.4	0.4
Filter Strip	0.4	0.4	0.5
Permeable Paviours	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6

Table 009: Excerpt from CIRIA 753 Table 26.3 SuDS Mitigation Indices for Discharges to Surface Waters

- 5.9.3 Review of the above data indicates the Mitigation Index for each of the SuDS Components to be above the identified Pollution

Hazard Index for TSS and Hydrocarbons present within runoff generated by the property.

- 5.9.4 Based on this data, it is concluded that the proposed SuDS Mitigation measures outlined above and expanded on below, are sufficient to mitigate potential contaminants present within the runoff from the generated by the development.

Water Quality Treatment

- 5.9.5 The following water quality treatment measures will be interspersed throughout the development and will service the different built elements as follows:

- Roof drainage will pass to the attenuation facility via minor swales / filter drains which will slow flows and encourage sediment deposition upstream of the detention area. It is recommended that silt traps be fitted to the base of all roof gulleys to remove suspended silts and sediments upstream of the swale / filter drain;
- Potentially contaminated runoff from the driveways, roads and hardstanding will be passed to the attenuation facility via the following additional water quality treatment, designed in accordance with the requirements of the SuDS Manual section 4 (Table 4.3) and Section 26 (Tables 26.2 and 26.3) and comprising:
 - **Filter Strips:** 0.3m wide grass / crushed stone strips present at the edge of the property / driveway / filter drains to slow runoff and encourage sediment deposition;
 - **Filter Drains:** Interspersed throughout the property and at its perimeter and designed to convey runoff into the detention area via an underlying permeable pipe. Permeable pipework to be wrapped in porous membrane to prevent sediment ingress;
 - **Permeable Paviours:** Runoff would be intercepted at source and infiltrated into the underlying porous sub-base. An underlying drainage blanket will direct runoff into permeable pipework at the edge of the paviours for onward conveyance to the detention facility. The paviours will slow runoff and encourage sediment deposition upstream of the main storage area. Hydrocarbons present will be removed through adsorption, adhesion and microbial processes within the paviours and underlying sub-base; and
 - **Detention Basin:** Reeds / aquatic planting to encourage silt / sediment deposition and to further aid water quality polishing.

- 5.9.6 The SuDS measures interspersed throughout the development will encourage the settlement and retention of sediments upstream of the main surface water storage areas, ensuring their efficiency is maintained over time and that only clean water is discharged. The proposed layout includes significant expanses of soft landscaping, which will function as overland flow routes, further promoting water quality.

- 5.9.7 Given the nature of the development (residential) the potential contaminant sources are considered to be limited, with no further water quality treatment proposed.

- 5.9.8 The underlying clay (bedrock) geology and significant depth to groundwater will prevent the opening of contaminant pathways between surface and groundwater and ensure that the attenuation measures do not suffer impacts to efficiency arising from groundwater ingress.

5.10 Management and Maintenance Responsibility

- 5.10.1 The property owner (as named on the deed of title) will be responsible for ensuring the ongoing management and maintenance of the surface water management systems serving the dwelling, either directly or via an appointed contractor / managing agent. Where the property(ies) is / are sold this responsibility will be transferred to the purchaser or their appointed managing agent.

Inspection and Maintenance Schedule

- 5.10.2 It is proposed that a programme of inspection and maintenance be executed for the surface water management systems by the property owner / managing agent, or their appointed drainage contractor. This should be undertaken in accordance with the schedule outlined in Table 010 and following significant rainfall events and / or storm activity.

- 5.10.3 A photographic record of inspections should be undertaken to pick up long term changes that may not be apparent within a single visit. Inspections should comply with all relevant Health and Safety legislation.

5.10.4 This maintenance schedule applies for the lifetime of the development.

Notes

5.10.5 Where silt removal is proposed, this should be undertaken in an environmentally sensitive manner. For example, reed beds should be removed and replaced to encourage rapid recovery of habitats which may have become reliant on the drainage feature.

5.10.6 All waste arisings should be collected by an approved contractor and should be subject to appropriate treatment and disposal (where applicable). The property owner or managing agent should be contacted where blockages are identified.

Element	Frequency	Notes
Gulleys / Gully Pots / Drainage grates / Pipework	Twice annually / following storm activity	- Remove grill and check for debris / blockage. - Remove accumulated debris to prevent blockage of below ground pipework. - Rod / jet where required. Silt traps to be cleansed before and after rodding.
Manholes / Inspection Covers / pipework	Twice annually / following storm activity	- Visual inspection – remove cover, shine torch into manhole. - Check every orifice for blockage / siltation. - Pour water into each to verify through flow. - Remove debris /silt and rod / jet where required. Silt traps to be cleansed before and after rodding.
Silt Traps	Twice annually / following storm activity	- Visual inspection, removal of accumulated silt. - Where rodding of manholes is proposed silt traps should be cleansed before and after to prevent silt bypassing the traps.
Filter Strips	Quarterly / following storm activity	- Regular mowing and maintenance will be key to ensuring the continued efficiency of the filter strips. - Reseeding or turfing should be undertaken where bald patches or die back occur.
Permeable Pavements / Filter Drains	Twice annually / following storm activity	- Visual inspection for accumulated silt / vegetation (at surface). - Check for surface clogging / ponding. Remove vegetation / silt. - Remove siltation / blockage from the stone sub-base and/or underlying pipework serving the drainage blanket.
Detention Basin	Quarterly / following storm activity	- Visual inspection for siltation and reduced efficiency / storage volume. Where excessive siltation is seen, remedial works should be undertaken. - Visual inspection and removal of accumulated vegetation, debris.
Inlets / Outfalls	Twice annually / following storm activity	- Visual inspection for accumulated debris or blockage, at both upstream and downstream faces. - Check every orifice / inlet / outlet / structure for blockage or siltation, pour water into each to verify through flow. - Remove debris and rod where required.
Vegetation	Quarterly (ensure cutting / strimming at least twice during peak growing seasons, e.g. Mar. / Sept.)	- Regular grass cutting and maintenance of shrubs / trees will be key in reducing the build-up of debris which could block the drainage network & / or cause eutrophication. - Grass should be cut quarterly, with focus on the growing season (Mar. – Oct.) and leaves / debris cleared from landscaped areas. - During the winter shrubs and trees should be pruned to reduce accumulated vegetation.

Table 010: Drainage Inspection and Maintenance Schedule

5.11 Foul Discharges

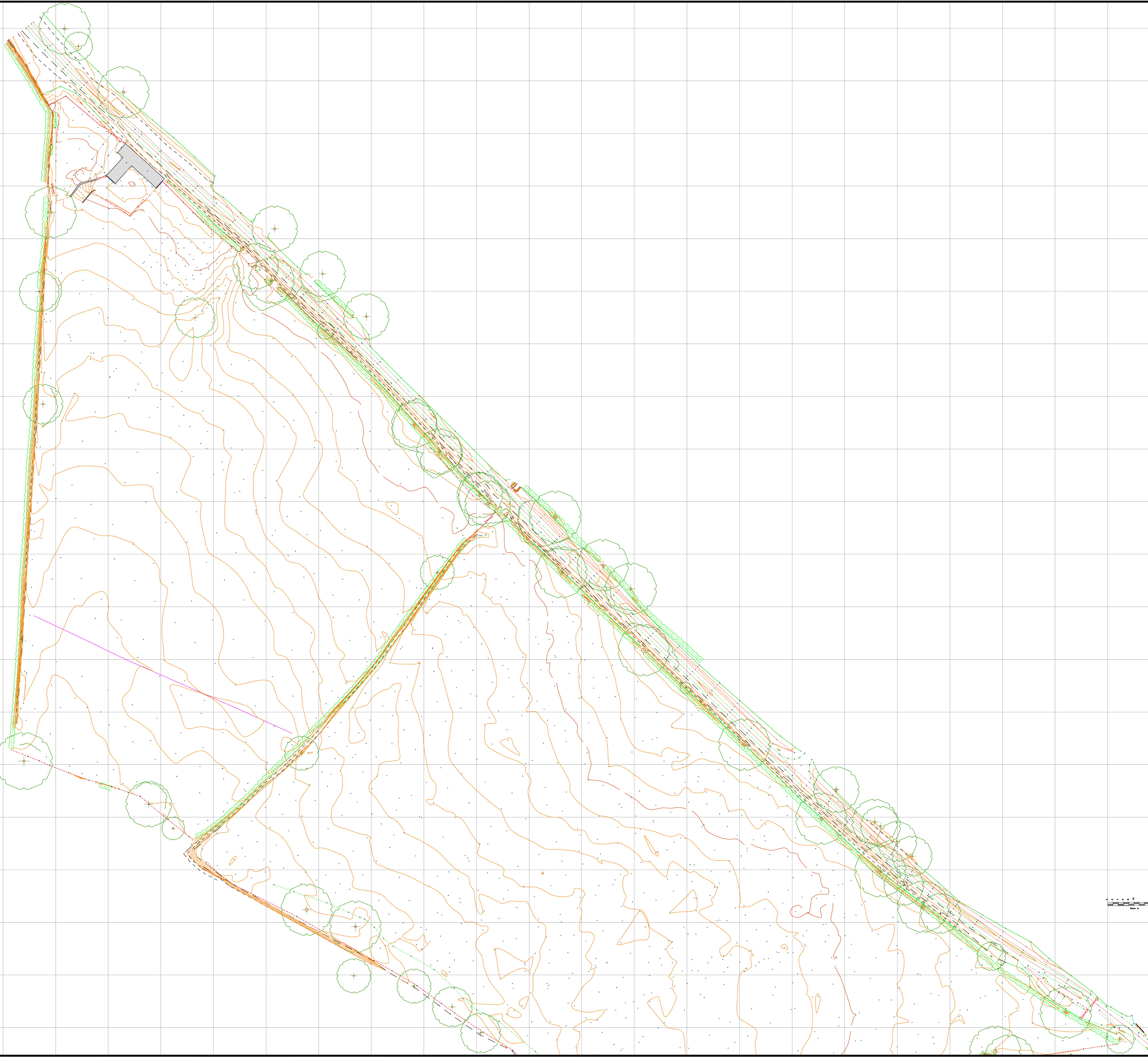
- 5.11.1 It is understood that the property will discharge foul arisings to a private on-site package treatment solution comprising a Klargester Bio-Disc and associated drainage field. The feasibility of this solution is understood to have been demonstrated by recent ground investigation works including infiltration testing.

6.0 CONCLUSIONS

- 6.0.1 Amber Planning Ltd. has been appointed by Mr. Adam Tarver to prepare a Flood Risk Assessment in support of a paragraph 80 application to provide a new 4 bed family home of exemplar environmental and design quality, comprising a two storey dwelling, energy generating water tower, car port and associated soft landscaping on land south west of Sutton Lane, Market Bosworth, Leicestershire, CV13 0AD. The Market Bosworth area falls within the administrative remit of Hinckley & Bosworth Borough Council and Leicestershire County Council, with the latter comprising the Lead Local Flood Authority.
- 6.0.2 This Flood Risk Assessment has been completed in accordance with the guidance set out in the NPPF, Section 14, and its accompanying PPG, for 'More Vulnerable' development within Flood Zone 1. The requirements of Local Planning Policy, including the SFRA, have also been accounted for within this assessment.
- 6.0.3 A scoping exercise has been completed which considers all potential flood risks, each of which have been fully assessed as part of this study, taking account of the development lifetime and climate change predictions, and with the principal flood risk identified to arise from surface water sources, which has been duly assessed and concluded to be **Low** throughout the development lifetime.
- 6.0.4 Flood mitigation has been incorporated within the development design to reduce identified residual flood risks to an acceptable level throughout the anticipated development lifetime. Flood management has also been specified to reduce those risks which cannot be borne out through design to an acceptable level. This includes consideration of flood warning and designation of points of safe refuge, access and egress.
- 6.0.5 The surface water attenuation requirements for the property have been assessed using the WinDes Micro Drainage software package for return period rainfall events up to and including 100 years, taking account of existing runoff rates, land use data and climate change consideration and with a total storage of 69m³ proposed. Controlled gravitational discharge to the Sutton Brook on the southern boundary is proposed, with this restricted to existing Greenfield rates.
- 6.0.6 Sustainable Drainage (SuDS) measures, including filter drains, permeable paving and a detention basin are incorporated within the design of the surface water management systems, with these interspersed throughout the development to promote infiltration at source and to reduce the rate and volume of runoff for more minor rainfall events. These will be supplemented with water re-use measures including tanks / water butts for use in watering gardens. This to reduce over reliance on potable supply for non-potable uses.
- 6.0.7 All drainage networks have been designed to account for industry best practice with regards system capacity, and with safety factors accounted for within the surface water storage calculations to allow for successive rainfall events, fluctuations in flow and flood levels, climate change sensitivity and losses in efficiency associated with siltation.
- 6.0.8 It is duly presented that the provision of a formal surface water management system, which incorporates on-site attenuation and water quality treatment, will ensure that potential detrimental impacts to flood risk and water quality are suitably mitigated throughout the anticipated development lifetime, in accordance with the National Planning Policy Framework and its accompanying Planning Practice Guidance. The requirements of Local Planning Policy and Technical studies have also been accounted for within this assessment.
- 6.0.9 The **Property Owner** or an appointed agent will be responsible for the management and maintenance of the surface water management systems, throughout the development lifetime. The responsibility for management and maintenance will pass to the lessee, where the property is subject to lease by a third party, and to the purchaser where the property is subject to sale.
- 6.0.10 The mitigation solutions noted within this report are subject to agreement with the Environment Agency, Hinckley & Bosworth Borough Council and Leicestershire County Council in their respective capacities within the Lead Local Flood Authority and as part of the application process.
- 6.0.11 It is duly presented that the development proposals are appropriate within the context of the NPPF and Local Planning Policy.

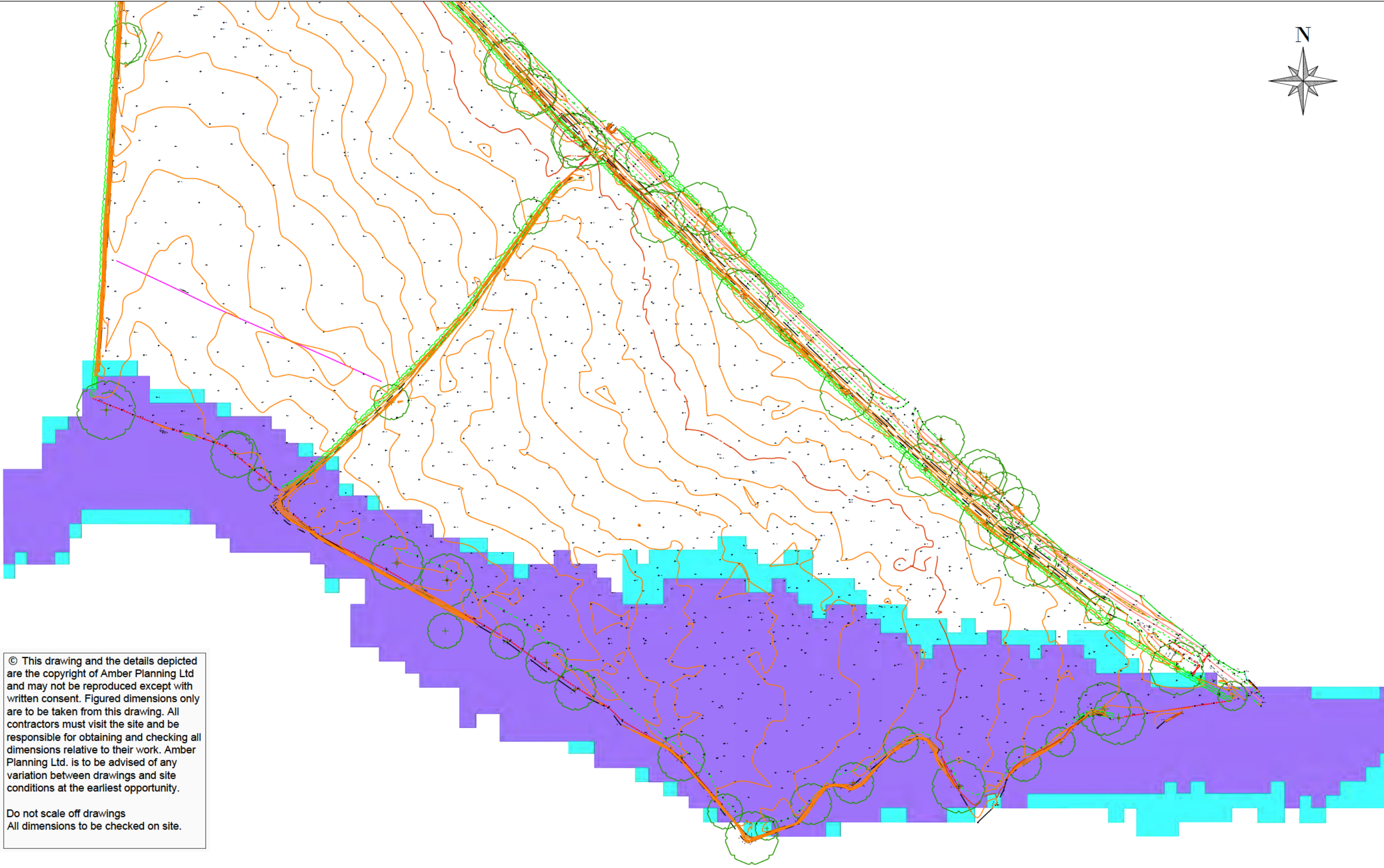
7.0 CLOSURE

- 7.0.1 This report has been prepared by Amber Planning Ltd. with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with The Client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.
- 7.0.2 Reliance has been placed on factual and anecdotal data obtained from the sources identified. Amber Planning Ltd. cannot be held responsible for the scope of work, or any omissions, misrepresentation, errors or inaccuracies within the supplied information. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part in the event of delay between the writing of the report and its consideration by The Client, with particular regard to submission of a planning application.
- 7.0.3 This report is for the exclusive use of The Client; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Amber Planning.
- 7.0.4 Amber Planning disclaims any responsibility to The Client and others in respect of any matters outside the agreed scope of the work.



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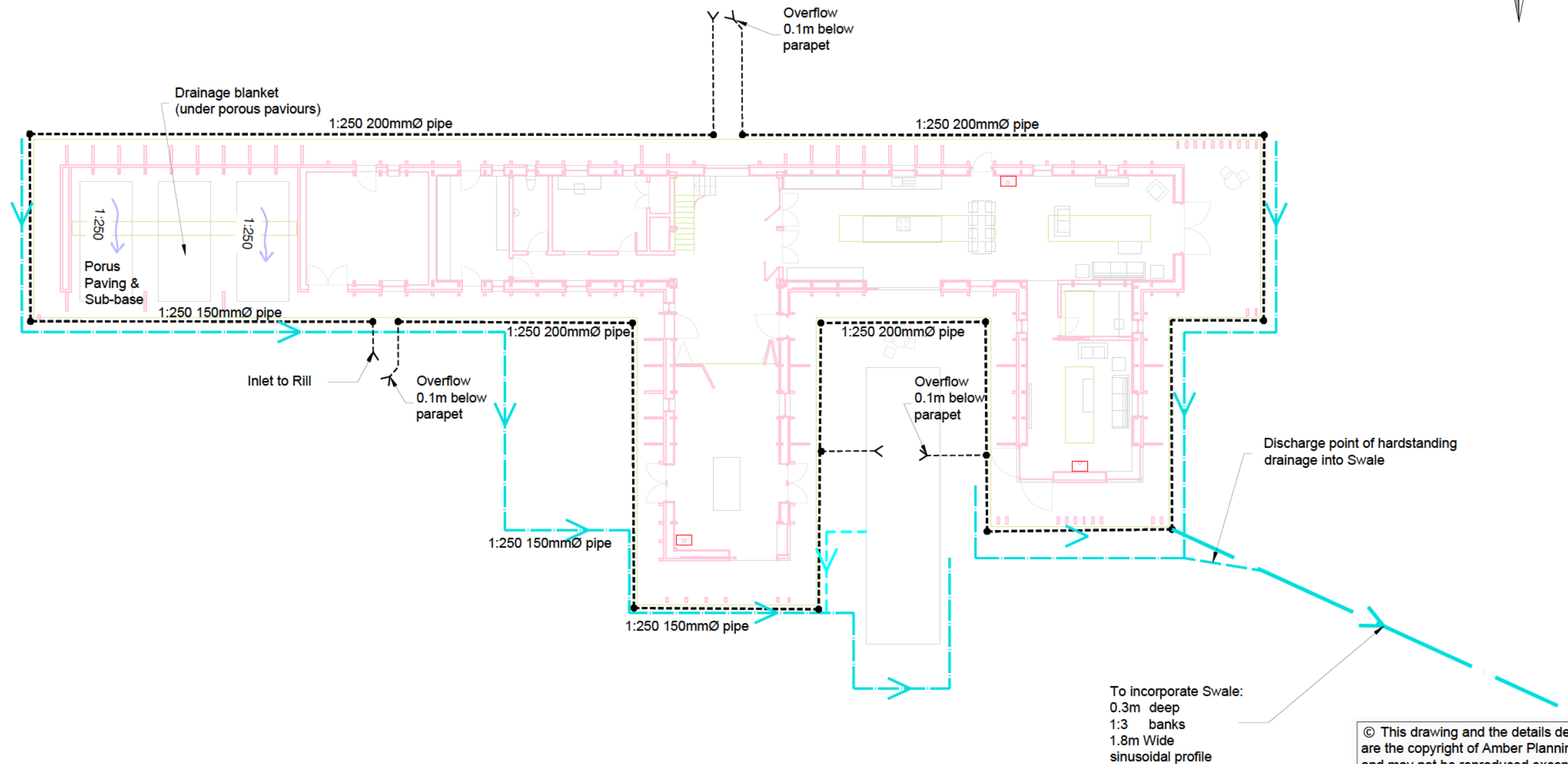
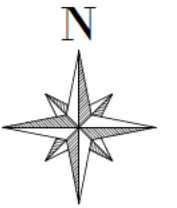
AB A



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Amber Planning Ltd www.amberplanning.co.uk Tel. 07930 877447	KEY EA Flood Zone 2 EA Flood Zone 3	NOTES:	SCALE 1:1250 @ A3	PROJECT NO. H8495	PROJECT Market Bosworth
			DATE Jan 2023	DRAWING NO. H8495-001	DRAWING TITLE Environment Agency Flood Risk Map
			DRAWN KR	CHECKED KdS	CLIENT -



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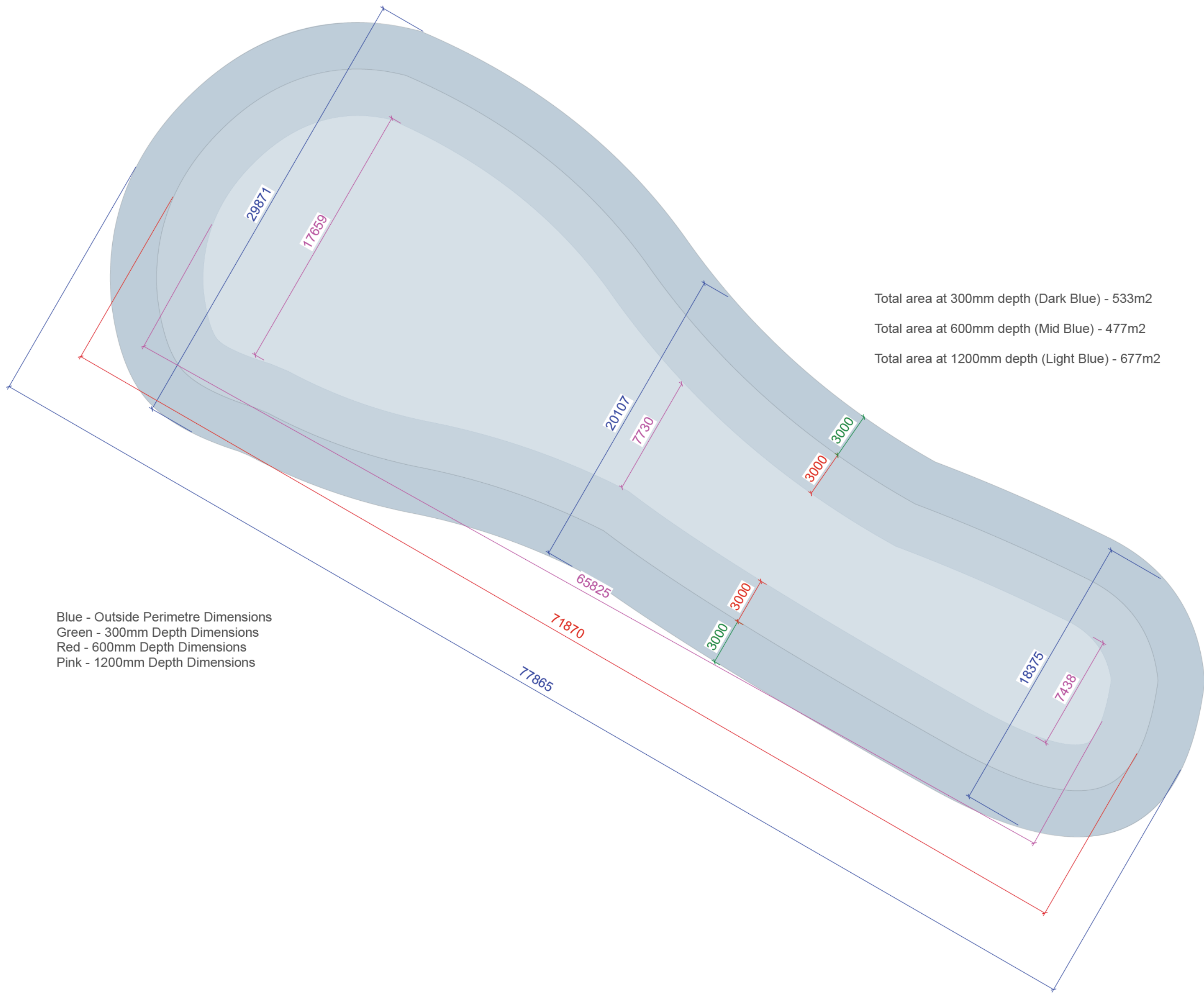
KEY	
---●---	Roof Drainage (to discharge to on-site water features via a flapped valve which will close when the water features are full. Return flow to main pipework via an overflow to prevent surcharge.)
---<---	Inlet/Outlet/Overflow (Rill)
>	Arrow indicates Direction of Flow
---	Filter Drain & Permeable Pipework
---	Pipework Serving Hardstanding Areas

NOTES:

SCALE		PROJECT NO.	PROJECT
1:200 @ A3		H8495	Land off A247
DATE		DRAWING NO.	DRAWING TITLE
May 2023		H8495-002	Conceptual Drainage Layout
DRAWN		CHECKED	CLIENT
KR		KdS	-

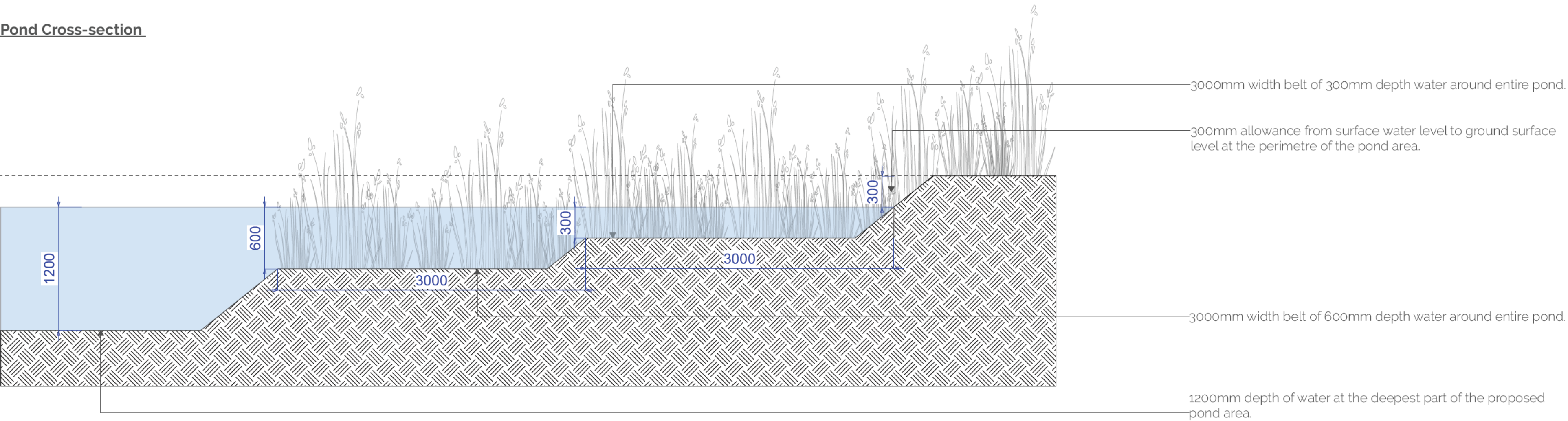


Pond Dimensions

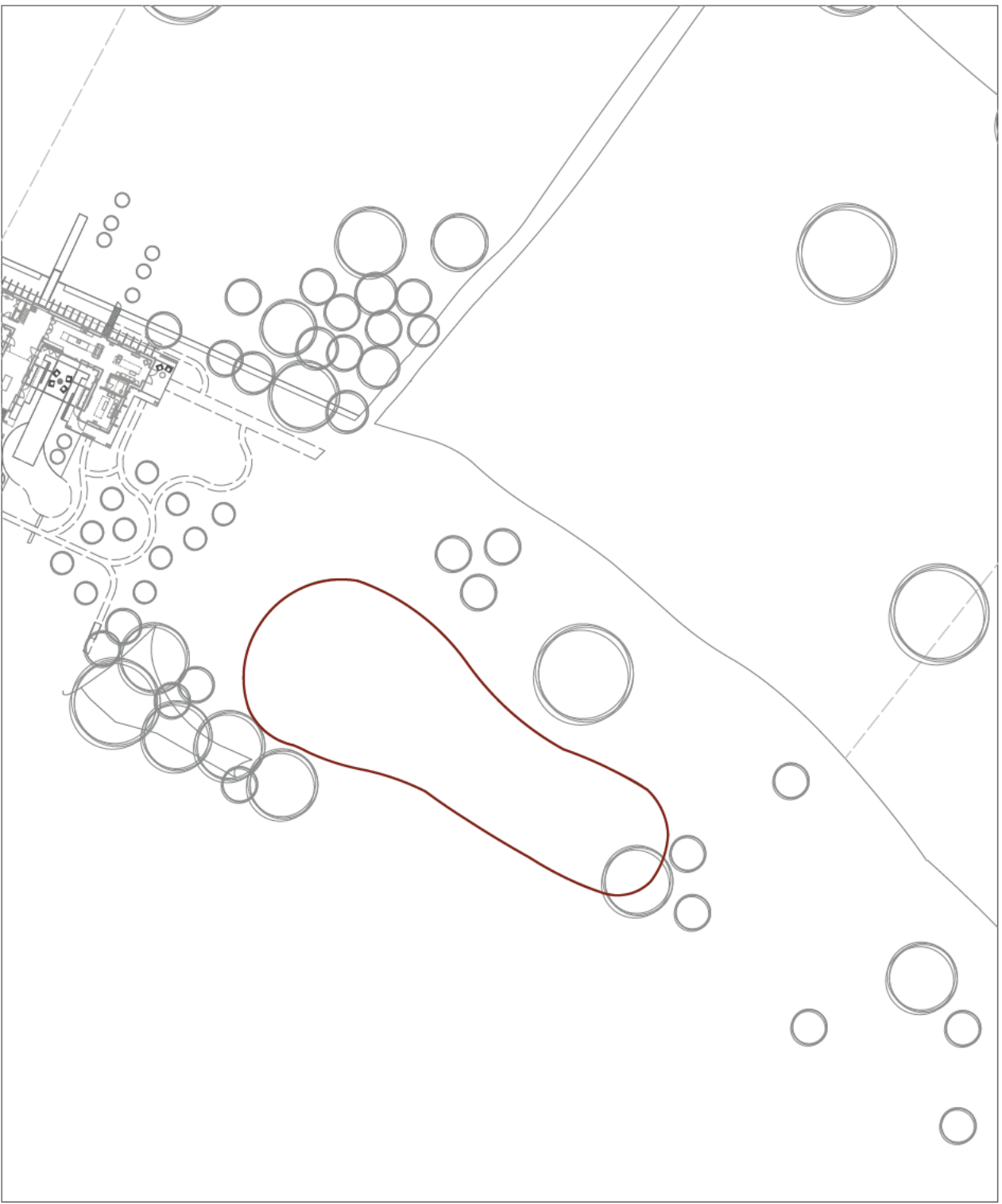


D04-15-01 Scale 1:200

Pond Cross-section



D04-15-02 Scale 1:30



Key

Scale Bar

Issue	Purpose	Date	S/O
1	Stage 3	04/07/2023	AF

This drawing is the property of Studio 31 Ltd and cannot be used in part or as a whole without consent
Drawing to be used for the 'use' status highlighted below only
All materials and procedures to be carried out in accordance with current statutory legislation and British Standards
This drawing is to be read in conjunction with relevant consultant and contractor drawings
Structural engineer to review all construction drawings and sign off prior to works.
All dimensions to be checked by contractor and any errors or inconsistencies should be reported to the landscape architect immediately

Drawing Title: Presentation Design 15 - Pond Area	
Project: Breach House	Date: 14.06.2023
Drawing Reference: S31 22199 D04	Revision: 1
Scale: 1:1000	Sheet: ISO A1

BH 1 SK40SW 40

4038 0311

GROUND LEVEL 128.9m O.D. approx.

BORING: FINISHED 11/10/83
HOLE SIZE 150mm dia to 10.0m

SAMPLE OR TEST		CHANGE OF STRATA			
DEPTH	TYPE	LEGEND	DEPTH	O.D. LEVEL	DESCRIPTION
			0.2	128.7	Brown stony sandy TOPSOIL
0.5	D1				
0.9-1.3	U(4)1				Hard friable grey and yellow brown sandy CLAY with black carbonaceous specks and occasional gravel.
1.4	D2				
1.5-1.9	U(4)2				
			1.8	127.1	
2.0	D3				
2.2-2.6	U(4)3				
2.7	D4				
3.3	D5				
3.6-4.0	U(4)4				
4.1	D6				Loose to medium dense orange brown and red brown slightly clayey SAND with occasional gravel and small siltstone fragments.
5.0	D7				
5.5-5.9	U(4)5				
6.0	D8				
7.0	D9				
7.5-7.9	D10				
7.65-7.95	S(17)				
8.5	D11				
9.55-10.0	D12				
9.70-10.00	S(19)				
			10.0	118.9	
REMARKS There was a slight water seepage at 8.5m. On completion the hole was backfilled to 5m then a standpipe inserted, protected by a metal sleeve and cap concreted into the ground. This standpipe was dry when checked on 17/10/83 and 9/11/83.					
KEY: D — DISTURBED SAMPLE S () STANDARD PENETRATION TEST B — BULK DISTURBED SAMPLE C () CONE PENETRATION TEST W — WATER SAMPLE NO. OF BLOWS FOR 300 mm U — UNDISTURBED SAMPLE PENETRATION IN BRACKETS					

SOILS ENGINEERING LIMITED PETERBOROUGH

BH2 SK40SW 41

4035 0313

GROUND LEVEL 127.8m O.D. approx.

BORING: FINISHED 11/10/83

HOLE SIZE 150mm dia to 6.6m

SAMPLE OR TEST		CHANGE OF STRATA			
DEPTH	TYPE	LEGEND	DEPTH	O.D. LEVEL	DESCRIPTION
0.5	D1		0.3	127.5	Brown sandy TOPSOIL
0.9-1.3	U(4)1				Very stiff friable orange brown and red brown very sandy CLAY with occasional gravel and black carbonaceous streaks.
1.4	D2				
1.5-1.9	D3		1.5	126.3	
1.65-1.95	S(12)				
2.2-2.6	U(4)2				Loose to medium dense red brown slightly clayey SAND with occasional gravel and small siltstone fragments. Traces of black carbonaceous specks below 5m.
2.7	D4				
3.7-4.1	D5				
3.85-4.15	S(9)				
5.0	D6				
5.55-6.0	B1				
6.2-6.6	D7				
6.35-6.65	S(11)		6.6	121.2	
REMARKS The borehole was dry during boring and remained dry the next day. KEY: D - DISTURBED SAMPLE S () STANDARD PENETRATION TEST B - BULK DISTURBED SAMPLE C { } CONE PENETRATION TEST W - WATER SAMPLE NO. OF BLOWS FOR 300 mm U - UNDISTURBED SAMPLE PENETRATION IN BRACKETS					

SOILS ENGINEERING LIMITED PETERBOROUGH

③

1063 Wt. 22438/0384 10m 7/45 (51) F&S.

No. 2 BORE

(For Survey use only)

SK49/238

RECORD OF WELL (SHAFT OR BORE)

1-inch Map Registered No.

At: Horsing Site,Town or Village Sutton Cheney,County LincolnshireSix-inch quarter sheet 35 NE/WFor Mr. Market Broom R.D.C. (L.A. Freeman, Hunsley)Exact site of well (in enclosure)Attach a tracing from
a map, or a sketch-
map, if possible.Level of ground surface
above sea-level (O.D.) 402 ft.If well-top is not at ground
level, state how far ...above; _____ ft.
below; _____ ft.

SHAFT _____ ft.; diameter _____ ft. Details of headings _____

BORE 50 ft.; diameter of bore: at top 6 ins.; at bottom 6 ins. Lengths,
diameters, perforations, etc., of lining tubes 44' 0" x 6" top 1' 0" b.g.l. Perforated between 35' and 47'
with 13/16" holes. Mounted externally from 3' to 25'; from 28' 0" to 50' in gravel
Water struck at depths, below well top, of (feet) filler was placed

Rest-level of water 10 ft. ^{above} well-top. Suction at _____ ft. Yield on 14 hours' pumping, 540 gal.
per hour with depression to 30 ft. below well-top. Capacity of pump 1000 g.p.h. Recovery to

rest level in _____ mins. Date of measurements June 28 Date of well June 18

Quality of water (attach copy of analysis if available)

Well made by _____

Information from _____

Additional notes in space overleaf.

(For Survey use only)
GEOLOGICAL
CLASSIFICATION

NATURE OF STRATA

THICKNESS

DEPTH

Feet

Ins.

Feet

Ins.

If measurements start below ground surface, e.g.,
from bottom of an existing shaft, state how farSee
186/A

Soil

6

6

Yellow boulder clay

3

0

3

6

Red boulder clay

5

6

9

0

Sand

1

0

10

0

Red boulder clay

25

0

35

0

Sand & gravel — water

13

0

48

0

Soft brown silty clay

2

0

50

0

Continued over leaf

GEOLOGICAL SURVEY AND MUSEUM,
SOUTH KENSINGTON,
LONDON, S.W.7.Date
received
4.10.48Correspondence
File No.1" N.S. Map
No.
1551" O.S. Map
No.Site marked (use symbol)
on 1" Map on 6" Map
② ②

Amber Planning Flood Risk & Hydrology		Page 1
46 Ash Lane Wells Somerset BA5 2LS		
Date 26/01/2023 16:29 File	Designed by kirsten.d... Checked by	
Micro Drainage	Source Control W.12.6	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	50.000	Urban	0.007
SAAR (mm)	681	Region Number	Region 5

Results 1/s

QBAR Rural 212.7
QBAR Urban 215.3

Q100 years 761.9

Q1 year 187.3
Q30 years 515.7
Q100 years 761.9

Amber Planning Flood Risk & Hydrology					Page 1		
46 Ash Lane		H8495					
Wells		Breach House					
Somerset BA5 2LS		Market Bosworth					
Date Apr. 2023		Designed by K de Savary					
File 230128-H8495-Win...		Checked by					
Micro Drainage		Source Control W.12.6					
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.304	0.304	0.5	0.0	0.5	37.6	O K
30 min Summer	0.345	0.345	0.6	0.0	0.6	43.8	O K
60 min Summer	0.385	0.385	0.6	0.4	1.0	50.3	O K
120 min Summer	0.421	0.421	0.6	0.8	1.4	56.2	O K
180 min Summer	0.437	0.437	0.7	0.9	1.6	58.9	O K
240 min Summer	0.444	0.444	0.7	1.0	1.6	60.2	O K
360 min Summer	0.451	0.451	0.7	1.0	1.7	61.3	O K
480 min Summer	0.455	0.455	0.7	1.0	1.7	62.0	O K
600 min Summer	0.457	0.457	0.7	1.0	1.7	62.4	O K
720 min Summer	0.458	0.458	0.7	1.0	1.7	62.6	O K
960 min Summer	0.454	0.454	0.7	1.0	1.7	62.0	O K
1440 min Summer	0.444	0.444	0.7	0.9	1.6	60.1	O K
2160 min Summer	0.426	0.426	0.7	0.8	1.5	57.0	O K
2880 min Summer	0.410	0.410	0.6	0.7	1.4	54.4	O K
4320 min Summer	0.387	0.387	0.6	0.4	1.1	50.5	O K
5760 min Summer	0.369	0.369	0.6	0.2	0.8	47.6	O K
7200 min Summer	0.350	0.350	0.6	0.0	0.6	44.6	O K
8640 min Summer	0.322	0.322	0.6	0.0	0.6	40.2	O K
10080 min Summer	0.296	0.296	0.5	0.0	0.5	36.4	O K
15 min Winter	0.334	0.334	0.6	0.0	0.6	42.1	O K
30 min Winter	0.377	0.377	0.6	0.3	0.9	48.9	O K
60 min Winter	0.420	0.420	0.6	0.8	1.4	56.0	O K
120 min Winter	0.459	0.459	0.7	1.0	1.7	62.8	O K
Storm Event			Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)		
15 min Summer			180.602	0.0	34		
30 min Summer			105.732	0.0	49		
60 min Summer			61.900	1.7	76		
120 min Summer			36.239	6.2	130		
180 min Summer			26.495	9.4	186		
240 min Summer			21.216	11.9	240		
360 min Summer			15.511	15.5	300		
480 min Summer			12.421	18.1	360		
600 min Summer			10.454	20.0	426		
720 min Summer			9.081	21.5	494		
960 min Summer			7.226	23.0	630		
1440 min Summer			5.236	23.0	900		
2160 min Summer			3.794	20.5	1300		
2880 min Summer			3.019	17.7	1688		
4320 min Summer			2.146	10.4	2484		
5760 min Summer			1.685	4.4	3344		
7200 min Summer			1.396	0.2	4256		
8640 min Summer			1.198	0.0	5016		
10080 min Summer			1.052	0.0	5752		
15 min Winter			180.602	0.0	34		
30 min Winter			105.732	0.9	48		
60 min Winter			61.900	5.1	74		
120 min Winter			36.239	10.8	128		
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46 Ash Lane
Wells
Somerset BA5 2LS

H8495
Breach House
Market Bosworth

Date Apr. 2023

Designed by K de Savary

File 230128-H8495-Win...

Checked by

Micro Drainage

Source Control W.12.6



Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	0.477	0.477	0.7	1.1	1.8	66.0	O K
240 min Winter	0.486	0.486	0.7	1.2	1.9	67.6	O K
360 min Winter	0.492	0.492	0.7	1.2	1.9	68.7	O K
480 min Winter	0.495	0.495	0.7	1.2	1.9	69.3	O K
600 min Winter	0.496	0.496	0.7	1.2	1.9	69.4	O K
720 min Winter	0.494	0.494	0.7	1.2	1.9	69.1	O K
960 min Winter	0.486	0.486	0.7	1.2	1.9	67.6	O K
1440 min Winter	0.466	0.466	0.7	1.1	1.8	64.0	O K
2160 min Winter	0.438	0.438	0.7	0.9	1.6	59.1	O K
2880 min Winter	0.416	0.416	0.6	0.8	1.4	55.4	O K
4320 min Winter	0.388	0.388	0.6	0.5	1.1	50.8	O K
5760 min Winter	0.370	0.370	0.6	0.2	0.8	47.8	O K
7200 min Winter	0.347	0.347	0.6	0.0	0.6	44.2	O K
8640 min Winter	0.309	0.309	0.6	0.0	0.6	38.2	O K
10080 min Winter	0.275	0.275	0.5	0.0	0.5	33.3	O K

Storm Event	Rain (mm/hr)	Overflow Volume (m ³)	Time-Peak (mins)
180 min Winter	26.495	14.6	182
240 min Winter	21.216	17.4	236
360 min Winter	15.511	21.7	304
480 min Winter	12.421	24.7	376
600 min Winter	10.454	27.1	452
720 min Winter	9.081	28.9	526
960 min Winter	7.226	31.1	674
1440 min Winter	5.236	32.4	956
2160 min Winter	3.794	29.6	1364
2880 min Winter	3.019	25.7	1756
4320 min Winter	2.146	15.3	2564
5760 min Winter	1.685	6.2	3464
7200 min Winter	1.396	0.1	4480
8640 min Winter	1.198	0.0	5280
10080 min Winter	1.052	0.0	6048

Amber Planning Flood Risk & Hydrology		Page 3
46 Ash Lane Wells Somerset BA5 2LS	H8495 Breach House Market Bosworth	
Date Apr. 2023 File 230128-H8495-Win...	Designed by K de Savary Checked by	
Micro Drainage	Source Control W.12.6	

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.292	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.310	Shortest Storm (mins)	15
Site Location		F (1km)	2.363	Longest Storm (mins)	10080
C (1km)	-0.029	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.361	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time / Area Diagram

Total Area (ha) 0.113

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.023	4-8	0.023	8-12	0.023	12-16	0.022	16-20	0.022

Amber Planning Flood Risk & Hydrology		Page 4
46 Ash Lane Wells Somerset BA5 2LS	H8495 Breach House Market Bosworth	
Date Apr. 2023 File 230128-H8495-Win...	Designed by K de Savary Checked by	
Micro Drainage	Source Control W.12.6	

Model Details

Storage is Online Cover Level (m) 0.800

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	97.3	0.800	235.0

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 0.000

Orifice Overflow Control

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 0.343

Amber Planning Flood Risk & Hydrology					Page 1		
46 Ash Lane		H8495					
Wells		Breach House					
Somerset BA5 2LS		Market Bosworth					
Date Apr. 2023		Designed by K de Savary					
File 230128-H8495-Win...		Checked by					
Micro Drainage		Source Control W.12.6					
<u>Summary of Results for 30 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.212	0.212	0.5	0.0	0.5	24.4	O K
30 min Summer	0.246	0.246	0.5	0.0	0.5	29.1	O K
60 min Summer	0.284	0.284	0.5	0.0	0.5	34.5	O K
120 min Summer	0.323	0.323	0.6	0.0	0.6	40.4	O K
180 min Summer	0.345	0.345	0.6	0.0	0.6	43.8	O K
240 min Summer	0.359	0.359	0.6	0.1	0.7	46.0	O K
360 min Summer	0.371	0.371	0.6	0.2	0.8	48.0	O K
480 min Summer	0.375	0.375	0.6	0.3	0.9	48.6	O K
600 min Summer	0.378	0.378	0.6	0.3	0.9	49.1	O K
720 min Summer	0.380	0.380	0.6	0.3	1.0	49.4	O K
960 min Summer	0.381	0.381	0.6	0.4	1.0	49.6	O K
1440 min Summer	0.379	0.379	0.6	0.3	0.9	49.2	O K
2160 min Summer	0.372	0.372	0.6	0.2	0.8	48.1	O K
2880 min Summer	0.363	0.363	0.6	0.1	0.7	46.7	O K
4320 min Summer	0.333	0.333	0.6	0.0	0.6	42.0	O K
5760 min Summer	0.302	0.302	0.5	0.0	0.5	37.3	O K
7200 min Summer	0.275	0.275	0.5	0.0	0.5	33.3	O K
8640 min Summer	0.252	0.252	0.5	0.0	0.5	30.0	O K
10080 min Summer	0.231	0.231	0.5	0.0	0.5	27.1	O K
15 min Winter	0.233	0.233	0.5	0.0	0.5	27.4	O K
30 min Winter	0.271	0.271	0.5	0.0	0.5	32.7	O K
60 min Winter	0.312	0.312	0.6	0.0	0.6	38.8	O K
120 min Winter	0.355	0.355	0.6	0.0	0.6	45.4	O K
Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)				
15 min Summer	117.979	0.0	34				
30 min Summer	70.778	0.0	48				
60 min Summer	42.462	0.0	76				
120 min Summer	25.474	0.0	134				
180 min Summer	18.893	0.0	192				
240 min Summer	15.282	0.2	248				
360 min Summer	11.334	1.6	362				
480 min Summer	9.168	2.9	418				
600 min Summer	7.778	4.0	472				
720 min Summer	6.800	4.7	528				
960 min Summer	5.466	5.2	662				
1440 min Summer	4.018	4.7	940				
2160 min Summer	2.953	3.3	1364				
2880 min Summer	2.374	1.6	1796				
4320 min Summer	1.712	0.0	2648				
5760 min Summer	1.358	0.0	3424				
7200 min Summer	1.134	0.0	4192				
8640 min Summer	0.979	0.0	4936				
10080 min Summer	0.865	0.0	5664				
15 min Winter	117.979	0.0	34				
30 min Winter	70.778	0.0	48				
60 min Winter	42.462	0.0	76				
120 min Winter	25.474	0.1	132				
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Amber Planning Flood Risk & Hydrology		Page 3
46 Ash Lane Wells Somerset BA5 2LS	H8495 Breach House Market Bosworth	
Date Apr. 2023	Designed by K de Savary	
File 230128-H8495-Win...	Checked by	
Micro Drainage		Source Control W.12.6

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.292	Cv (Winter)	0.840
Return Period (years)	30	E (1km)	0.310	Shortest Storm (mins)	15
Site Location		F (1km)	2.363	Longest Storm (mins)	10080
C (1km)	-0.029	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.361	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time / Area Diagram

Total Area (ha) 0.113

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.023	4-8	0.023	8-12	0.023	12-16	0.022	16-20	0.022

Amber Planning Flood Risk & Hydrology		Page 4
46 Ash Lane Wells Somerset BA5 2LS	H8495 Breach House Market Bosworth	
Date Apr. 2023 File 230128-H8495-Win...	Designed by K de Savary Checked by	
Micro Drainage	Source Control W.12.6	

Model Details

Storage is Online Cover Level (m) 0.800

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	97.3	0.800	235.0

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 0.000

Orifice Overflow Control

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 0.343

Amber Planning Flood Risk & Hydrology					Page 1		
46 Ash Lane		H8495					
Wells		Breach House					
Somerset BA5 2LS		Market Bosworth					
Date Apr. 2023		Designed by K de Savary					
File 230128-H8495-Win...		Checked by					
Micro Drainage		Source Control W.12.6					
<u>Summary of Results for 2 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.090	0.090	0.3	0.0	0.3	9.4	O K
30 min Summer	0.111	0.111	0.3	0.0	0.3	11.8	O K
60 min Summer	0.135	0.135	0.4	0.0	0.4	14.7	O K
120 min Summer	0.162	0.162	0.4	0.0	0.4	18.0	O K
180 min Summer	0.177	0.177	0.4	0.0	0.4	19.9	O K
240 min Summer	0.187	0.187	0.4	0.0	0.4	21.3	O K
360 min Summer	0.200	0.200	0.4	0.0	0.4	22.9	O K
480 min Summer	0.207	0.207	0.4	0.0	0.4	23.8	O K
600 min Summer	0.212	0.212	0.5	0.0	0.5	24.5	O K
720 min Summer	0.216	0.216	0.5	0.0	0.5	25.1	O K
960 min Summer	0.220	0.220	0.5	0.0	0.5	25.6	O K
1440 min Summer	0.222	0.222	0.5	0.0	0.5	25.8	O K
2160 min Summer	0.218	0.218	0.5	0.0	0.5	25.2	O K
2880 min Summer	0.210	0.210	0.5	0.0	0.5	24.3	O K
4320 min Summer	0.190	0.190	0.4	0.0	0.4	21.6	O K
5760 min Summer	0.172	0.172	0.4	0.0	0.4	19.3	O K
7200 min Summer	0.156	0.156	0.4	0.0	0.4	17.3	O K
8640 min Summer	0.143	0.143	0.4	0.0	0.4	15.6	O K
10080 min Summer	0.131	0.131	0.3	0.0	0.3	14.2	O K
15 min Winter	0.100	0.100	0.3	0.0	0.3	10.6	O K
30 min Winter	0.123	0.123	0.3	0.0	0.3	13.3	O K
60 min Winter	0.150	0.150	0.4	0.0	0.4	16.5	O K
120 min Winter	0.180	0.180	0.4	0.0	0.4	20.3	O K
Storm Event			Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)		
15 min Summer			45.973	0.0	33		
30 min Summer			29.114	0.0	47		
60 min Summer			18.437	0.0	76		
120 min Summer			11.676	0.0	132		
180 min Summer			8.937	0.0	188		
240 min Summer			7.394	0.0	246		
360 min Summer			5.660	0.0	360		
480 min Summer			4.682	0.0	418		
600 min Summer			4.042	0.0	482		
720 min Summer			3.584	0.0	546		
960 min Summer			2.946	0.0	680		
1440 min Summer			2.235	0.0	958		
2160 min Summer			1.696	0.0	1372		
2880 min Summer			1.394	0.0	1776		
4320 min Summer			1.038	0.0	2564		
5760 min Summer			0.842	0.0	3344		
7200 min Summer			0.715	0.0	4056		
8640 min Summer			0.627	0.0	4840		
10080 min Summer			0.560	0.0	5552		
15 min Winter			45.973	0.0	33		
30 min Winter			29.114	0.0	47		
60 min Winter			18.437	0.0	74		
120 min Winter			11.676	0.0	130		
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H8495

Breach House

Market Bosworth

Designed by K de Savary

Checked by

Source Control W.12.6



Summary of Results for 2 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	0.197	0.197	0.4	0.0	0.4	22.5	OK
240 min Winter	0.209	0.209	0.4	0.0	0.4	24.1	OK
360 min Winter	0.224	0.224	0.5	0.0	0.5	26.1	OK
480 min Winter	0.232	0.232	0.5	0.0	0.5	27.2	OK
600 min Winter	0.236	0.236	0.5	0.0	0.5	27.8	OK
720 min Winter	0.241	0.241	0.5	0.0	0.5	28.4	OK
960 min Winter	0.244	0.244	0.5	0.0	0.5	28.8	OK
1440 min Winter	0.242	0.242	0.5	0.0	0.5	28.7	OK
2160 min Winter	0.233	0.233	0.5	0.0	0.5	27.3	OK
2880 min Winter	0.220	0.220	0.5	0.0	0.5	25.6	OK
4320 min Winter	0.189	0.189	0.4	0.0	0.4	21.5	OK
5760 min Winter	0.164	0.164	0.4	0.0	0.4	18.2	OK
7200 min Winter	0.142	0.142	0.4	0.0	0.4	15.6	OK
8640 min Winter	0.125	0.125	0.3	0.0	0.3	13.5	OK
10080 min Winter	0.110	0.110	0.3	0.0	0.3	11.8	OK

Storm Event	Rain (mm/hr)	Overflow Volume (m ³)	Time-Peak (mins)
180 min Winter	8.937	0.0	186
240 min Winter	7.394	0.0	242
360 min Winter	5.660	0.0	354
480 min Winter	4.682	0.0	458
600 min Winter	4.042	0.0	508
720 min Winter	3.584	0.0	574
960 min Winter	2.946	0.0	730
1440 min Winter	2.235	0.0	1038
2160 min Winter	1.696	0.0	1480
2880 min Winter	1.394	0.0	1908
4320 min Winter	1.038	0.0	2724
5760 min Winter	0.842	0.0	3512
7200 min Winter	0.715	0.0	4256
8640 min Winter	0.627	0.0	5008
10080 min Winter	0.560	0.0	5744

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Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.292	Cv (Winter)	0.840
Return Period (years)	2	E (1km)	0.310	Shortest Storm (mins)	15
Site Location		F (1km)	2.363	Longest Storm (mins)	10080
C (1km)	-0.029	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.361	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time / Area Diagram

Total Area (ha) 0.113

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.023	4-8	0.023	8-12	0.023	12-16	0.022	16-20	0.022

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Model Details

Storage is Online Cover Level (m) 0.800

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	97.3	0.800	235.0

Orifice Outflow Control

Diameter (m) 0.022 Discharge Coefficient 0.600 Invert Level (m) 0.000

Orifice Overflow Control

Diameter (m) 0.040 Discharge Coefficient 0.600 Invert Level (m) 0.343