



101330 Thornton Daycare,
Leicestershire
Flood Risk Assessment

Thornton Daycare, Leicestershire Flood Risk Assessment

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CONTENTS

1.0	INTRODUCTION	6
2.0	SITE DESCRIPTION	7
3.0	POLICIES	9
4.0	FLOOD RISK TO THE SITE	12
5.0	FLOOD MITIGATION MEASURES	17
6.0	FLOOD RISK FROM THE DEVELOPMENT	18
7.0	CONSIDERATION OF SUSTAINBLE DRAINAGE SYSTEMS	19
8.0	DRAINAGE STRATEGY	21
9.0	WATER QUALITY	22
10.0	CONCLUSIONS	23
11.0	REFERENCES	24

APPENDICES

- A. SITE LAYOUT
- B. TOPOGRAPHICAL SURVEY
- C. SEVERN TRENT WATER SEWER RECORDS
- D. PRODUCT 4 DATA
- E. GREENFIELD RUN-OFF RATE
- F. DRAINAGE LAYOUT
- G. EXTRACTS FROM PHASE 2 GROUND INVESTIGATIONS
- H. PROPOSED DRAINAGE CALCULATIONS

Executive Summary

Flood Risk

This Flood Risk Assessment has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) (Ref. 4), Planning Practice Guidance (PPG) (Ref. 15) and the Environment Agency's Flood Risk Assessment (EAFRA) Guidance Notes and the best practices in flood risk management (Ref. 6).

The development proposal includes the demolition of 2 existing building, the construction of a new daycare centre, a play area and the associated infrastructure works.

The Indicative Flood Maps indicate that more than half of the site falls within Flood Zone 1, resulting in an annual probability of fluvial and tidal flooding of less than 1 in 1000 (<0.1%). Approximately a third of the site, located to the east, is situated in Flood Zone 2 due to its proximity to the Rothley Brook. This indicates a low to medium risk with a probability of flooding between 1 in 100 and 1 in 1000 (1% to 0.1%) annually. A very small portion of the site lies within Flood Zone 3 along its eastern boundary, due to its proximity to the Rothley Brook, indicating a high probability of flooding. Areas within Flood Zone 3 have a 1% or more chance of flooding from rivers, or a 0.5% or more chance of flooding from the sea in any given year.

The Environment Agency (EA) "Risk of Flooding from Surface Water" maps indicate that the whole site, including the area where the new proposed building is to be located is at very low risk from surface water flooding. A small area to the east of the site, along the site's boundary and Rothley Brook is at low, medium and high risk from surface water flooding, with the areas at medium and high risk being limited to the banks of the Rothley Brook. A balanced levels strategy and sustainable surface water drainage proposals will ensure that the risk from surface water flooding to the site is reduced, therefore the risk of surface water flooding to the site is considered low.

The DEFRA MAGIC maps "Drinking Water Safeguard Zones (Groundwater)" show that the site sits outside of Drinking Water Safeguard protection Zones.

Drainage Strategy

The surface water strategy utilises a private surface water sustainable drainage network designed to serve the proposed building and hardstanding areas. The system will utilise filter drains, with catch pits, and cellular attenuation tanks prior to discharge into the Rothley Brook Watercourse. A non-return valve will be installed on the outfall pipe to prevent backflow into the system.

The proposed building's foul water discharges will be collected through a network of private foul water drains, leading to a private foul water treatment plant. From there, the treated water will be directed to a package pump unit, which will then discharge it via a pumped outfall into the Rothley Brook Watercourse.

1.0 Introduction

- 1.1 Dice Consulting Engineers Ltd. (Dice) has been commissioned by Corporate Architecture Ltd. to conduct a Flood Risk Assessment (FRA) for a proposed new daycare centre and its associated infrastructure works.
- 1.2 This FRA has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) (Ref. 4), Planning Practice Guidance (PPG) (Ref. 15), Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment (2017) (Ref. 19) and the best practices in flood risk management.
- 1.3 The assessment has been prepared using our best engineering judgement. The report is based on the following information:
 - Topographic information;
 - National Planning Policy Framework (NPPF);
 - Practical Guidance to the NPPF;
 - Leicestershire County Council Preliminary Flood Risk Assessment, June 2011;
 - Leicestershire County Council Preliminary Flood Risk Assessment Update, June 2017;
 - Leicestershire County Council Local Flood Risk Management Strategy, August 2015;
 - Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment, October 2017;
 - Leicester City Level 2 Strategic Flood Risk Assessment, February 2012;
 - Leicester Local Flood Risk Management Strategy, December 2024;
 - British Geological Survey Mapping;
 - Indicative Flood Maps from the Environment Agency (EA) website.
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- 1.5 Dice has completed this report for the benefit of the organisations/individuals referred to in paragraph 1.1; and any relevant Statutory Authority which may require reference in relation to approvals for the proposed redevelopment of the site. Other third parties should not use or rely upon the contents of the report unless written approval has been gained from Dice.
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2.0 Site Description

Site Location & Surroundings

- 2.1 The site is located approximately 11.70km northwest of Leicester City Centre, grid reference X: 447228, Y: 306555.

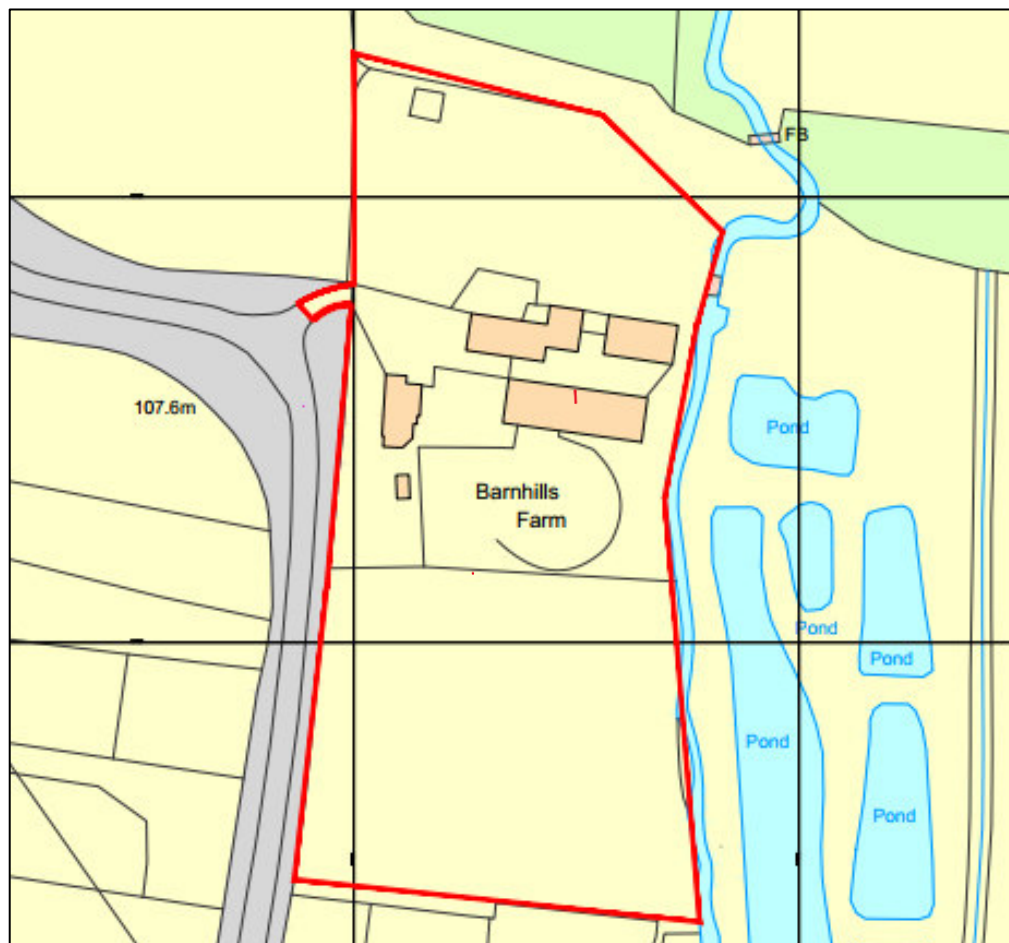


Figure 1 – Site Location Plan

Site Description

- 2.2 The application site is classified as brownfield and includes existing farm buildings and large areas of grassland to the north and south of the proposed daycare centre. Located off Merrylees Road, the site is rectangular in shape and covers an approximate development area of 1.44 hectares. It is situated west of the Rothley Brook watercourse, with dense vegetation extending along its entire northern boundary.
- 2.3 The site is located wholly within the Leicester City Council boundary with Leicestershire County Council acting as the Lead Local Flood Authority (LLFA) for the area.
- 2.4 A copy of the site layout can be found in **Appendix A**.

Topography

- 2.5 The site levels are fairly flat, falling in easterly and south-easterly directions. The site's high point of approximately 107.29m above ordnance datum (AOD) is located in its north-western corner, descending to a low point of 105.55m AOD on the its south-east boundary. Detailed topographical information is available in **Appendix B**.

Proposal

- 2.6 The development proposals include the demolition of a couple of existing farm buildings and the erection of a new daycare centre, car park and associated infrastructure works.

Geology

- 2.7 The 1:50,000 British Geological Survey (BGS) maps shows that most of the site is situated upon the bedrock geology of Alluvium - Clay, silt, sand and gravel. Sedimentary superficial deposit formed between 11.8 thousand years ago and the present during the Quaternary period.

Hydrology and Hydrogeology

- 2.8 The closest watercourse to the site is the Rothley Brook, located on the site's eastern boundary. There are no designated Main Rivers or any other ordinary watercourses that can represent a flood risk to the site.
- 2.9 According to DEFRA MAGIC map the site area is identified as having medium groundwater vulnerability.
- 2.10 According to DEFRA MAGIC map the site is located on a Secondary Type B (bedrock) aquifer and Secondary Type A (superficial drift) aquifer.

Existing Drainage

- 2.11 Severn Trent Water is responsible for the operation and maintenance of public sewers within the local area.
- 2.12 An asset Location Search including a sewer record plan has been provided by Severn Trent Water to confirm the presence of existing sewers within the vicinity of the proposed site. The map indicates that there are no public sewers crossing the development boundary or located in close proximity to it. The nearest public sewers to site are 150mm diameter combined sewers located approximately 350m south-west of the site through third party land. A copy of the sewer records can be found within **Appendix C**.
- 2.13 There are no available drainage surveys for the site, however, the proposed drainage strategy is to utilise new drainage infrastructure to serve all the proposed development areas, reducing the amount of surface water leaving the site through the existing on-site drainage. Therefore, the risk of private drainage flooding the site is considered to be reduced for all existing areas and low for the proposed development.

Artificial Water Bodies

- 2.14 The nearest reservoir to site is the Thornton Reservoir, located approximately 700m to the north of the site.

3.0 Policies

- 3.1 This FRA has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) (Ref. 4), Planning Practice Guidance (PPG) (Ref. 15), Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment (2017) (Ref. 19) and the best practices in flood risk management.

National Planning Policy Framework (NPPF)

- 3.2 The National Planning Policy Framework (Ref. 4) sets out the Government's objectives for the planning system and how there should be a 'Presumption in Favour of Sustainable Development' and the planning system should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. The document seeks to ensure that flood risk is considered at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Reference should also be made to the Planning Practice Guidance (Ref. 15) which provides additional guidance on flood risk.
- 3.3 The NPPF states that when determining planning applications in areas of flood risk Local Planning Authorities must ensure that flood risk is not increased elsewhere and only consider developments appropriate where a site-specific FRA can demonstrate that:
- 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; and
 - development is appropriately flood resilient and resistant, including safe access and egress, where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage features.
- 3.4 For the purposes of applying the National Planning Policy Framework, areas at risk from all sources of flooding are included. For fluvial (river) and sea flooding, this is principally land within Flood Zones 2 and 3. It can also include an area within Flood Zone 1 which the Environment Agency has notified the local planning authority as having critical drainage problems.
- 3.5 The Flood and Water Management Act helps improve flood risk management and ensure the security of water supplies in England and Wales. This updates legislation to ensure better protection from flooding, manage water more sustainably, improve public services, and secure water resources during periods of drought.

The Flood and Water Management Act helps to reduce flood risk by:

- Clarifying who is responsible for managing all sources of flood risk;
- Encourage more sustainable forms of drainage in new developments;
- Makes it easier to resolve misconnections to sewers.

Flood and Water Management Act 2010

- 3.6 The Flood and Water Management Act imparts significant new roles and responsibilities on local authorities. County or unitary authorities are now classed as lead local flood authorities (LLFAs) who have responsibilities for managing local flood risk.

The responsibilities of a LLFA include:

- Prepare and maintain a strategy for local flood risk management in their areas; coordinating views and activity with other local bodies; and communities through public consultation and scrutiny, and delivery planning;
- Maintain a register of assets – these are physical features that have a significant effect on flooding in their area;

- Investigate significant local flooding incidents and publish the results of such investigations;
- Issue consents for altering, removing, or replacing certain structures or features on ordinary watercourses;
- Play a lead role in emergency planning and recovery after a flood event.

Planning Practice Guidance on Flood Risk & Coastal Change – 2022

- 3.7 The Government's planning policy on sustainable drainage systems came into effect on 22 August 2022. It centres on local planning policies and decisions on planning applications relating to major development (those of 10 or more dwellings; or equivalent non-residential; or mixed developments). It ensures that sustainable drainage systems for the management of run-off are put in place, unless demonstrated to be inappropriate. Lead Local Flood Authorities (LLFAs) have also been made statutory consultees and new non-statutory guidance has been published under the changes.
- 3.8 The changes follow a joint DEFRA/DCLG consultation on delivering SuDS published in September 2014 in which the Government dropped all the key provisions of Schedule 3 of the Flood & Water Management Act 2010 and SuDS Approval Bodies (SABs) in favour of passing oversight of SuDS from county councils (who are also LLFAs) to local planning authorities. According to the new planning policy, the following are expected of local planning authorities when considering planning applications:
- To consult the relevant lead local flood authority on the management of surface water;
 - To satisfy themselves that the proposed minimum standards of operation are appropriate;
 - To ensure, using planning conditions or planning obligations, that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.
- 3.9 The policy also states that the sustainable drainage systems should be designed to ensure that the maintenance and operation requirements are economically proportionate.

Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems -2022

- 3.10 The non-statutory technical standards for the design, maintenance and operation of sustainable drainage systems to drain surface water have been published by DEFRA. The standards apply to systems that drain surface water from housing, non-residential, or mixed-use developments for the lifetime of the developments. The non-statutory technical standards are to be used in conjunction with the National Planning Policy Framework, and Planning Practice Guidance on Flood Risk & Coastal Change - 2022.
- 3.11 The National Planning Policy Framework (NPPF) requires that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA). The SFRA identifies areas that may flood, considering all potential sources of flooding. It is used to inform planning policies and assist Local Planning Authorities in directing new development to areas of lower flood risk and ensure that new development helps to manage flood risk.

Strategic Flood Risk Assessment (SFRA)

- 3.12 The National Planning Policy Framework (NPPF) requires that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA). The SFRA identifies areas that may flood, considering all potential sources of flooding. It is used to inform planning policies and assist Local Planning Authorities in directing new development to areas of lower flood risk and ensure that new development helps to manage flood risk.

Preliminary Flood Risk Assessment (PFRA)

- 3.13 The purpose of the PFRA is to report 'Nationally Significant Areas of Flood Risk' to the EU from all flooding sources, except Main River and Reservoir which falls under the remit of the EA, and the public sewer network which falls under the remit of the water authority.
- 3.14 In line with requirements set out in the Flood Risk Regulations (2009), which was transposed from the European Floods Directive 2007/60/EC, a preliminary flood risk assessment has been completed by the Environment Agency. With this, areas across the country at significant risk of rivers, sea, or reservoir flooding have been identified. PFRAs assess the past and future flood risk which may have significant consequences for human health, the economy, the environment, and cultural heritage.
- 3.15 Regulations require the Environment Agency to undertake PFRAs for risk of flooding from rivers, sea, and reservoirs. Whilst Lead Local Flood Authorities (LLFAs) complete these for surface water, smaller watercourses, and groundwater flooding.

Leicestershire and Leicester City level 1 Strategic Flood Risk Assessment– October 2017

- 3.16 Leicestershire County Council and Leicester City commissioned JBA Consulting to undertake a Strategic Flood Risk Assessment (SFRA) for the Leicestershire County Council and Leicester City areas.
- 3.17 The SFRA contains a map of the flood risk within the area of the site from all sources. The map does not show any flood risk to the site which represents a significant discrepancy between the information contained in the SFRA and the online EA mapping and Product 4 data.
- 3.18 The SFRA shows a map of areas benefiting from flood defences. The site is shown to sit outside of such areas.
- 3.19 The historic flood map contained within the SFRA shows that no flood incidents have occurred within the vicinity of the site, however, the map does not provide detailed information.

Leicestershire County Council Preliminary Flood Risk Assessment – 2011

- 3.20 The Leicestershire County Council Preliminary Flood Risk Assessment (LCCPFRA) has been prepared in accordance with the Flood Risk Regulations 2009, which implement the requirements of the European Union Floods Directive. The aim of the European Floods Directive is to provide a consistent approach to managing flood risk across Europe. It establishes four stages of activity within a six-year flood risk management cycle and the PFRA is the first stage of this cycle.
- 3.21 The LCCPFRA has assessed historic and future flooding within Leicestershire and presents the risk of flooding from surface water and groundwater, however, the information is very high level making it difficult to interpret.
- 3.22 No other potential sources of flooding are identified for the area in the PFRA.

4.0 Flood Risk to the Site

Fluvial Sources

- 4.1 The site has been checked in accordance with the Indicative Flood Maps, which provide guidance on fluvial and tidal flood risk. The maps are shown in **Figure 2** below.

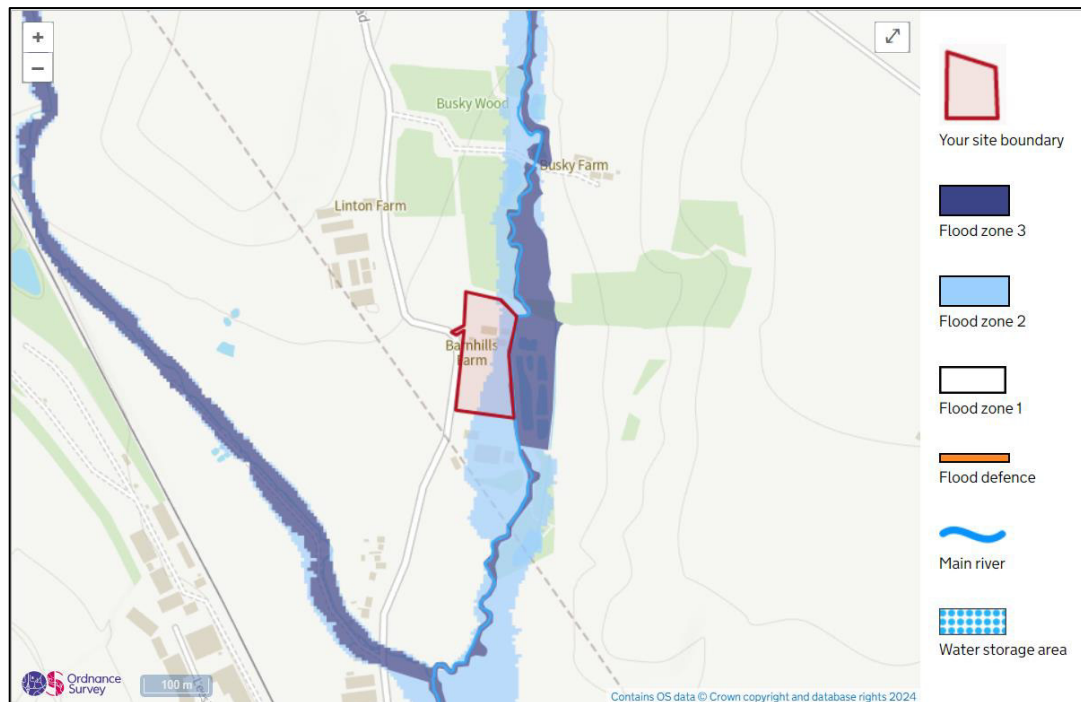


Figure 2 - Environment Agency Flood Map for Planning (Rivers and Sea)

Note: Environment Agency flood maps give guidance on fluvial flood risk only for watercourse with a catchment of greater than 3km². Other information should be checked for flood risk on ordinary watercourses with catchments less than 3km².

- 4.2 The Indicative Flood Maps indicate that more than half of the site falls within Flood Zone 1, resulting in an annual probability of fluvial and tidal flooding of less than 1 in 1000 (<0.1%). Approximately a third of the site, located to the east, is situated in Flood Zone 2 due to its proximity to the Rothley Brook. This indicates a low to medium risk with a probability of flooding between 1 in 100 and 1 in 1000 (1% to 0.1%) annually. A very small portion of the site lies within Flood Zone 3 along its eastern boundary, due to its proximity to the Rothley Brook, indicating a high probability of flooding. Areas within Flood Zone 3 have a 1% or more chance of flooding from rivers, or a 0.5% or more chance of flooding from the sea in any given year.
- 4.3 The development proposals include the demolition of two existing building and the construction of a new daycare centre and the associated infrastructure works.
- 4.4 The proposed building is situated partially within Flood Zone 1, with the remaining half located within Flood Zone 2.
- 4.5 The Environment Agency has provided flood data levels associated with the Rothley Brook at various node locations for a range of return periods within the vicinity of the application site. The information was sent in the form of Product 4 Data.
- 4.6 The Product 4 Data can be found in **Appendix D**.
- 4.7 The Product 4 Data shows a map with the closest Nodes to the proposed site, located along the Rothley Brook. Based on the map and the data provided by the EA, it is considered that

the most appropriate nodes in relation to the proposed development site are ROTH_25664d and ROTH_25419. Therefore, the flood data levels associated with those nodes have been used to evaluate the water levels of the brook in relation to the site proposed levels.

- 4.8 A table showing the water levels of the Rothley Brook for each node for the 1 in 100 years and 1 in 100 years plus 30% climate change allowance can be seen below:

National Grid reference		Modelled Levels (m AOD)		
Reference	X	Y	100 Return Period	100+37%CC_Return Period
ROTH_25664d	447291	306614	105.74	105.85
ROTH_25419	447286	306391	103.99	104.16

Table 1 –Product 4 Flood Data Levels

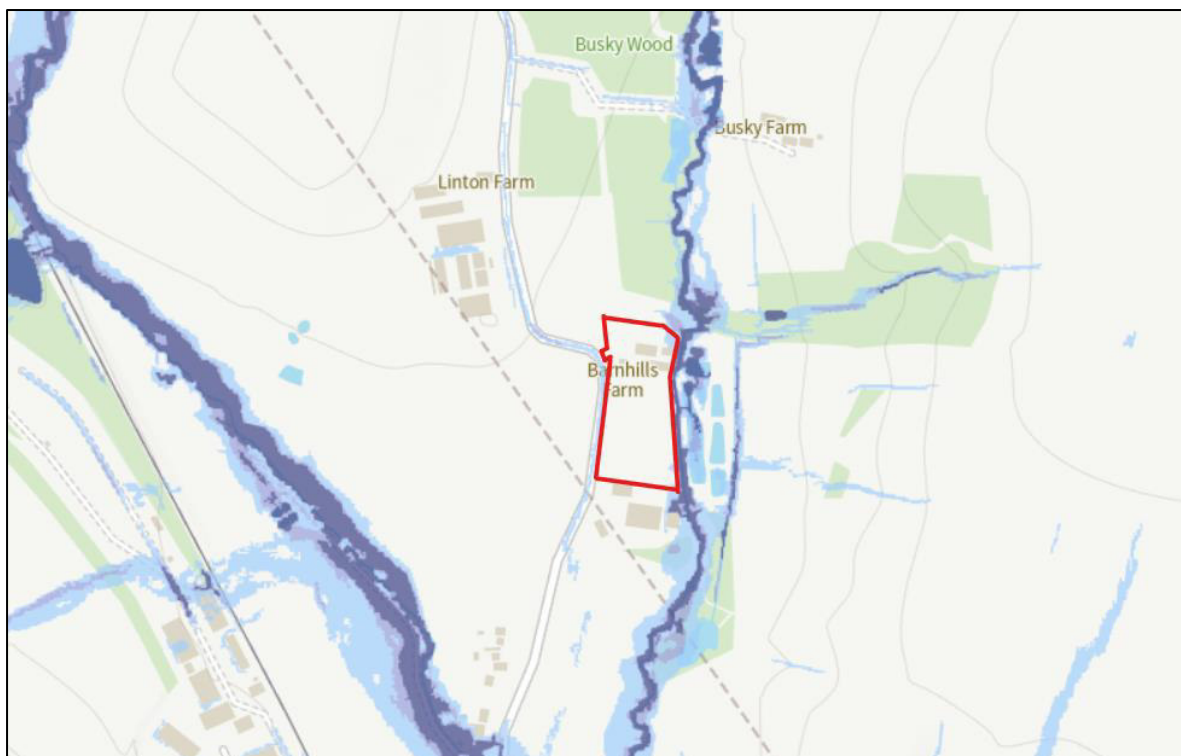
- 4.9 As per the above, during the 100-year plus 37% climate change event (37% taken due to lack of data for the 1 in 100 years plus 30% CC) associated with the Rothley Brook, the flood level associated with the higher from both Nodes is 105.85mAOD.
- 4.10 The lowest proposed external level for the proposed new daycare centre is approximately 106.24m AOD with the proposed finished floor level being 106.51, which are approximately 0.39m and 0.66m higher than the brook levels respectively. Due to the significant difference between the proposed site levels and watercourse flood levels the flood risk to the areas subject to development including the proposed daycare centre and associated infrastructure is considered low. Furthermore, a detailed review of the existing levels on site show that the existing buildings and external hardstanding areas all sit above the 1 in 100 years plus 37% CC.
- 4.11 There are areas along the site's eastern boundary which protrude onto Flood Zone 2. It is recommended that the existing levels of all landscaped areas within Flood Zone 2 are either lowered or retained as existing, where possible. This measure would ensure that the area's ability to store flood water is not worsened, thereby preventing increase of flood risk elsewhere.
- 4.12 In accordance with the National Planning Policy Framework (NPPF), the aim of a Sequential Test should be to direct any new development to Flood Zone 1. Should there be no reasonable sites available in Flood Zone 1, taking into consideration the flood risk vulnerability of land use, the Local Authority should consider reasonable sites available in Flood Zone 2, where the Exception Test is applied if required. Should there be no reasonable sites available in Flood Zones 1 & 2, taking into consideration the flood risk vulnerability of land use, the Local Authority should consider reasonable sites available in Flood Zone 3, where the Exception Test is applied if required.
- 4.13 If sites at lower risk of flooding are not available, any flood risk to people and property will be managed without stopping the development from progressing on site. The two requirements that need to be met for the Exception Test are:
- The development would provide wider sustainability benefits to the community that outweigh the flood risk; and
 - The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
- 4.14 The 'more vulnerable' proposed development of a new daycare centre in Flood Zones 1&2 will not require Sequential and Exception tests. This is in line with **Table 2** in National Planning Practice Guidance.

Flood Risk Vulnerability classification		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	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

Table 2 - Copy of Table 2 (Flood Risk Vulnerability and Flood Zone 'compatibility') from the National Planning Practice Guidance (Ref. 15)

Pluvial Flooding

- 4.15 Pluvial flooding occurs when natural and engineered systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, low duration summer rainfall event which overwhelms the local surface water drainage systems, or in rural areas during medium intensity, long duration events where saturated ground conditions prevent infiltration into the subsoil. This flood water would then be conveyed via overland flow routes dictated by the local topography.
- 4.16 The Environment Agency (EA) "Risk of Flooding from Surface Water" map, shown in **Figure 3** below, indicates that the whole site, including the area where the new proposed building is to be located is at very low risk from surface water flooding. A small area to the east of the site, along the site's boundary and Rothley Brook is at low, medium and high risk from surface water flooding, with the areas at medium and high risk being limited to the banks of the Rothley Brook. A balanced levels strategy and sustainable surface water drainage proposals will ensure that the risk from surface water flooding to the site is reduced, therefore the risk of surface water flooding to the site is considered low.
- 4.17 The site would be designed to convey any exceedance flows towards the existing landscaped areas, or retain them within the site boundary, and away from proposed and any adjacent existing properties.
- 4.18 The risk of surface water flooding for the site is considered low for the design storms.



**Figure 3 - Environment Agency Flood Mapping
Risk of Flooding from Surface Water**

Sewer Sources

- 4.19 An asset Location Search including a sewer record plan has been provided by Severn Trent Water to confirm the presence of existing sewers within the vicinity of the proposed site. The map indicates that there are no public sewers crossing the development boundary or located in close proximity to the boundary.
- 4.20 It is therefore concluded that the risk of sewer flooding on site is considered low.

Tidal/Coastal

- 4.21 The site is not coastal and is not affected by coastal or tidal flooding.

Groundwater Sources

- 4.22 Groundwater flooding occurs as a result of water rising from the underlying aquifer or from water flowing from abnormal springs. This can occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at shallow depth. Groundwater flooding is known to occur in areas underlain by major aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels.
- 4.23 A sustainable drainage system and suitable finished floor levels will reduce/eliminate the flood risk from groundwater in the areas within the site subject to development. The site would be designed to convey any exceedance flows towards the new and existing landscaped areas or retain them within the site boundary, and away from proposed and any adjacent existing properties. Therefore, the risk of groundwater flooding at the application site is considered low.

Artificial Water Bodies

- 4.24 Reservoir flooding may occur when a large reservoir fails and releases the water it holds. The Environment Agency defines a large reservoir as one that holds over 25,000m³ of water and states that such a failure is extremely unlikely.

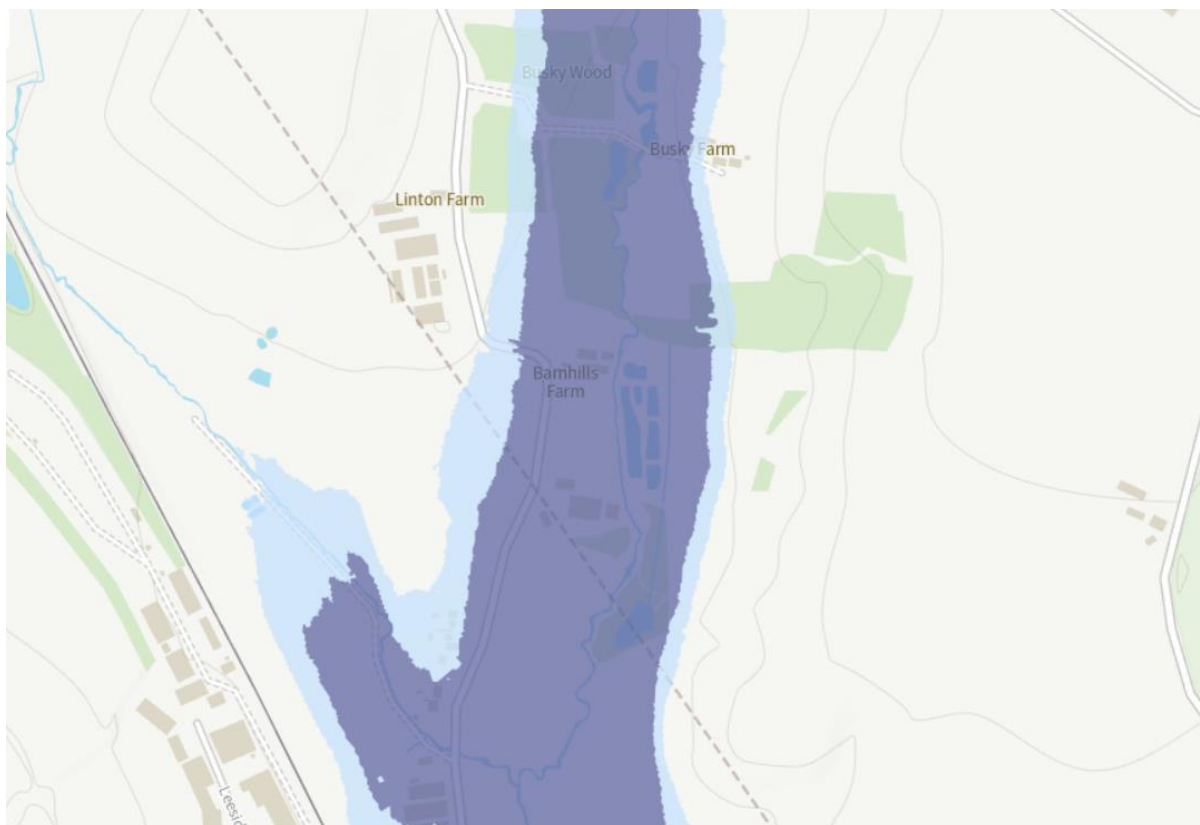


Figure 4 - Environment Agency Flood Mapping – Risk of Flooding from Reservoirs

- 4.25 **Figure 4** shows the Environment Agency ‘Risk of flooding from Reservoirs’ map and indicates that the whole site is within an area at risk of flooding from reservoirs. However, based on the extremely low likelihood of reservoir failure, the flood risk from reservoirs on site is considered low.

Historical Flooding

- 4.26 No specific flooding incidents within the vicinity of the site have been identified.
- 4.27 There are no formal flood defences within the vicinity of the site and the site is not identified to sit in an area benefiting from defences.

5.0 Flood Mitigation Measures

- 5.1 The proposed development consists of the construction of a new daycare centre, play area, parking and associated infrastructure. The lowest proposed finished external level is estimated to be 106.24m AOD with the proposed building FFL being 106.51m AOD. Therefore, the developable site areas are situated significantly higher than the flood levels.
- 5.2 The following mitigation measures are recommended to ensure adequate protection to the proposed site development in the event of flooding:
- The layout and proposed levels will be designed to ensure the proposed flood route plan simulates that of the pre-development site, directing all surface water runoff away from properties and towards the site's natural low points;
 - The surface water network will be designed to accommodate up to and including the 100 year + 40% climate change events;
 - The development should be enrolled in the Leicestershire County Council early flood warning scheme;
 - A suitable Evacuation Plan must be implemented in the event of flooding;
 - It is recommended that the existing levels of all landscaped areas within Flood Zone 2 are either lowered or retained as existing. This measure would ensure that the area's ability to store flood water is not worsened, thereby preventing increase of flood risk elsewhere;
 - An 8m easement from the top of river bank will be applied to the development to manage flood risk and ensure clear access for future river bank maintenance.

6.0 Flood Risk from the Development

- 6.1 The requirements of a Site-Specific Flood Risk Assessment, as outlined in the National Planning Practice Guidance (Ref. 15), should assess the following off-site impacts
- How will it be ensured that the proposed development and the measures to protect the site from flooding will not increase flood risk elsewhere?
 - How will run-off from the development be prevented from impacting elsewhere?
 - Are there any opportunities to reduce flood risk elsewhere?

- 6.2 The primary flood risk generated by the new development is most likely to be the risk posed to others by surface water run-off.

Existing Discharges

- 6.3 The application site is classified as brownfield and includes existing buildings, with large areas of grassland and vegetation surrounding the proposed building area. Located off Merrylees Road, the site is rectangular in shape and covers an approximate area of 1.43 hectares. However, the actual areas subject to redevelopment have been estimated to cover an approximate area of 0.25ha of which 0.204 is proposed to be impermeable.

- 6.4 The proposed daycare centre building and external areas are proposed to be located over existing buildings and hardstanding, which are to be removed as part of the development. The estimated existing impermeable area that is to be redeveloped as part of the proposals is approximately 0.13ha. The brownfield run-off rate generated by this existing area has been estimated to be 12.64l/s using the modified rational method.

- 6.5 The proposed drainage strategy proposes to utilise a discharge rate as close as practicable to the greenfield run-off calculated based on a development site area of 0.25ha, which has been estimated to be 1.15l/s. However, such a small discharge rate is unfeasible and will result in very small orifice opening at the proposed flow control on site which will increase the risk of blockages and subsequently flood risk for the development. Therefore, it is proposed to discharge surface water from site to the Rothley Brook at 2l/s. This discharge rate represents an approximate betterment of over 80% to the brownfield rates currently leaving the site from the developable areas. A copy of the greenfield run-off rate calculations can be seen in **Appendix E**.

Climate Change

- 6.6 Environment Agency 'Flood Risk Assessments – Climate Change Allowances', updated in May 2022, provides support to the National Planning Policy Framework (Ref. 4) on the impacts of climate change on flooding from the land, rivers and sea as part of a flood risk assessment. The biggest difference on this revision of the EA document is that there are specific allowances depending on the location across England. The EA provides maps for both peak rainfall allowances and peak river flow allowances and these need to be followed.
- 6.7 **Table 3** shows anticipated climate changes allowances for peak rainfall in the site location. For developments with a lifetime up to 2060, the '2050s' values need to be followed. For developments with a lifetime between 2061 and 2050, '2070s' values must be used.

London Management Catchment	3.3% annual exceedance rainfall event		1% annual exceedance rainfall event	
	Central Allowance	Upper end Allowance	Central Allowance	Upper end Allowance
2050s	20%	35%	20%	40%
2070s	20%	35%	25%	40%

Table 3 – Copy of peak rainfall intensity allowances in the area (use 1981 to 2000 baseline) from Environment Agency 'Flood Risk Assessments – Climate Change Allowances'

6.8 When considering the assumed 100-year lifetime of this type of development, the upper end allowances must be used.

6.9 Using **Table 3** above, the calculations required for the site application include 35% and 40% allowance for climate change for the 1 in 30-year event and 1 in 100 year event respectively.

Proposed Discharges

6.10 It is proposed to discharge surface water from site to the Rothley Brook at 2l/s. This discharge rate represents an approximate betterment of over 80% to the brownfield rates currently leaving the site from the developable areas.

6.11 A proposed drainage layout for the new daycare centre site has been included in **Appendix F**.

7.0 Consideration of Sustainable Drainage Systems

Surface Water

7.1 Surface water arising from a developed site should, as far as practical, be managed in a sustainable manner to mimic the surface water flows arising from the undeveloped site.

7.2 Part H of the Building Regulations 2015 recommends that surface water run-off shall discharge to one of the following, listed in order of priority:

- an adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable,
- a watercourse, or, where that is not reasonably practicable,
- a sewer.

7.3 Disposal of surface water run-off by the preferred method of infiltration is subject to verification of suitable ground soakage capacity and no contaminated ground issues. If the site is not suitable for infiltration drainage, evidence must be provided to the drainage authorities in the form of soakage test results or a statement from a suitable site investigation. If this is the case and no watercourses are within a reasonable distance from the site, the drainage authorities would consider a connection to the public sewer system.

7.4 Infiltration testing was undertaken on site by RDM Environmental and Geotechnical Engineering Ltd to ascertain if soakaways can be used as a viable method of discharging the surface water from the development site. The testing revealed that groundwater levels were too high for the test to be successful.

7.5 Following the above, infiltration on site is considered unviable.

7.6 Extracts from the Phase 2 Ground Investigation Report be found in **Appendix G**.

7.7 The National Standards Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems – March 2015 that deals with SuDS covers the whole range of sustainable approaches to surface water drainage management including:

- Source control measures including rainwater recycling;
- Infiltration devices to allow water to soak into the ground, that can include individual soakaways and communal facilities;
- Filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns;

- Filter drains and porous pavements to allow rainwater and run-off to infiltrate into permeable material below ground and provide storage if needed; and
- Basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding.

7.8 Each of the SuDS considerations listed above are discussed below with reference to their suitability for the proposed development.

SuDS Measures	Component	Feasibility for the site	Issues/ Description
Source Control	Rainwater Harvesting	Yes	Use may be considered but would only mitigate a small proportion of the increase in volume of runoff created by the proposed development. Rainwater butts can be used to save water use.
Infiltration Devices	Permeable paving	Yes	Permeable paving can be used with limited benefit for attenuation and water quality in private car parking bays, but at increased maintenance cost/ issues. May be used for attenuation and water quality control but no infiltration due to poor infiltration rates on site.
	Private soakaways	No	Infiltration is unviable on site, hence it has been concluded that the site is not suitable to support soakaways.
Filtration	Open Swales	Yes	Swales are considered viable for this site.
	Filter Strips	Yes	Filter strips are considered viable for this site.
Retention/ Detention	Detention Basins	No	Detention basins are unsuitable for the development site due to the high groundwater table and for health and safety reasons.
	Attenuation Ponds	No	Detention basins are unsuitable for the development site due to the high groundwater table and for health and safety reasons.

Table 4 – General Assessment of SuDS measures for the site

7.9 Based on the general assessment of the potential SuDS measures listed above, it is proposed that flows generated by the new development shall be collected by a network of filter drains and attenuated within a suitably sized cellular attenuation tanks, before discharging to the adjacent Rothley Brook at a controlled rate.

8.0 Drainage Strategy

Surface Water

- 8.1 The surface water strategy consists of a surface water drainage network that will collect runoff from the proposed building roof and external hardstanding areas, and discharge this into the adjacent brook at a controlled rate of 2l/s.
- 8.2 The total impermeable area to drain through the system has been calculated as approximately 0.204ha and has been used for the calculations. The proposed surface water drainage network has been modelled using Causeway Flow for all storm events of up to and including the 1 in 100 years plus 40 climate change.
- 8.3 The proposed drainage has been estimated to require an approximate attenuation volume of 110.3m³ which is to be accommodated within a cellular attenuation tanks.
- 8.4 Should the capacity of the proposed drainage system and storage be exceeded, the excess flow will be diverted overland to follow the existing surface water flood route path, away from the building and towards the site low points, simulating that of the pre-development flood route plan.
- 8.5 The proposed connection into the Rothley Brook and the proposed discharge rate of 2l/s will be subject to an Ordinary Watercourse Consent and agreements with the Lead Local Flood Authority and the Local Planning Authority.
- 8.6 An 8m easement has been shown on the plan from the top of the river bank line. The development will ensure no structures are permitted within this easement, and ensure any fencing proposals here are either post and rail or post and wire fencing as per the EA requirements. Should post and wire fencing be used, it must be either wire strands or at least 100mm spaced mesh.
- 8.7 The proposed site surface water and foul water drainage layout is shown in **Appendix F**.
- 8.8 The proposed drainage calculations are included in **Appendix H**.

Foul Water

- 8.9 The proposed foul water system will collect foul water flows generated by the proposed development and convey them towards a new proposed foul water treatment plant prior to discharging the treated flows to the adjacent brook via a pumped outfall.
- 8.10 The proposed outfall into the Rothley Brook will be subject to an Ordinary Watercourse Consent and agreements with the Lead Local Flood Authority and the Local Planning Authority.

9.0 Water Quality

Without adequate SuDS proposed the impermeable surfacing would cause increased risk of surface water runoff contamination. The risk posed by surface water runoff to the receiving environment is outlined within the CIRIA SuDS Manual (C753) and is a function of:

- The pollution hazard at a particular site (i.e. the pollutant source)
- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, and/or the effectiveness of underlying soil layers in protecting the receiving groundwater
- The sensitivity of the receiving environment (i.e. the environmental receptor)

The SuDS proposals within the scheme have been designed to treat the anticipated surface water runoff contamination to a safe level before discharging into the environment.

In line with Table 26.2 'Pollution Hazard Indices' the scheme is considered as low risk under the land use of 'non-residential car parking with infrequent change (e.g. schools, offices)' due to the lack of more specific classification and is to have the following pollution hazard indices:

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change (e.g. schools, offices) i.e. <300 traffic movements/day	Low	0.5	0.4	0.4

Copy of Table 26.2 SuDS mitigation indices for discharges to surface water (CIRIA C753),

Mitigation Indices			
Type of SuDS component	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention System	0.8	0.8	0.8
Permeable Pavement	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

Copy of Table 26.3 SuDS Mitigation Indices for discharges to surface waters (CIRIA C753)

To ensure that the proposed development SuDS remove runoff contaminants to safe levels, an analysis of the SuDS treatment train has been undertaken via the simple index approach.

Proposed SuDS Management Train: Filter Drains -> Outfall (Watercourse)

SuDS Pollution Mitigation Indices		Acceptability of Pollution Mitigation
Total Suspended Solids	0.40	Additional TSS Mitigation Required
Metals	0.40	Sufficient
Hydrocarbons	0.40	Sufficient

The SuDS proposals indicate for the most part that adequate pollution mitigation is provided. TSS indicates that further mitigation is required, therefore a catchpit will be provided prior to outfall which will ensure sufficient TSS mitigation is provided within the proposals.

10.0 Conclusions

- 10.1 Dice Consulting Engineers Ltd. (Dice) has been commissioned by Corporate Architecture Ltd. to conduct a Flood Risk Assessment (FRA) for a proposed new daycare centre and its associated infrastructure works.
- 10.2 The Indicative Flood Maps indicate that more than half of the site falls within Flood Zone 1, resulting in an annual probability of fluvial and tidal flooding of less than 1 in 1000 (<0.1%). Approximately a third of the site, located to the east, is situated in Flood Zone 2 due to its proximity to the Rothley Brook. This indicates a low to medium risk with a probability of flooding between 1 in 100 and 1 in 1000 (1% to 0.1%) annually. A very small portion of the site lies within Flood Zone 3 along its eastern boundary, due to its proximity to the Rothley Brook, indicating a high probability of flooding. Areas within Flood Zone 3 have a 1% or more chance of flooding from rivers, or a 0.5% or more chance of flooding from the sea in any given year.
- 10.3 The vulnerability of the development from fluvial, sewers, tidal, groundwater, and artificial sources has been assessed. Following assessment, the site is deemed to be at low risk from each of these.
- 10.4 The following mitigation measures are recommended to ensure adequate protection to the proposed development in the event of flooding:
- The layout and proposed levels will be designed to ensure the proposed flood route plan simulates that of the pre-development site, directing all surface water runoff away from properties and towards the site's natural low points;
 - The surface water network will be designed to accommodate up to and including the 100 year + 40% climate change events;
 - The development should be enrolled in the Leicestershire County Council early flood warning scheme;
 - A suitable Evacuation Plan must be implemented in the event of flooding;
 - It is recommended that the existing levels of all landscaped areas within Flood Zone 2 are either lowered or retained as existing. This measure would ensure that the area's ability to store flood water is not worsened, thereby preventing increase of flood risk elsewhere;
- 10.5 The proposed surface water and foul water strategy will not increase the flood risk at the site or elsewhere.

11.0 References

The following documents have been referred to in this report:

1. The Building Regulations 2015 Approved Document H
2. Design and Construction Guidance – Version 2.2 June 2022
3. Civil Engineering Specification for the Water Industry, 7th Edition
4. National Planning Policy Framework (NPPF) – March 2021
5. Environment Agency Flood Risk Standing Advice
6. Environment Agency 'Flood Risk Assessments – Climate Change Allowances' – May 2022
7. The SuDS Manual – CIRIA C753
8. Interim Code of Practice for Sustainable Drainage Systems – National SuDS Working Group, July 2004
9. British Geological Survey – Geology of Britain viewer <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>
10. Design and analysis of urban storm drainage. The Wallingford Procedure Vol.1
11. Institute of Hydrology Report No. 124 – Flood Estimation for small catchments
12. Flood and Water Management Act 2010
13. Water Industry Act 1999
14. Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems – March 2015
15. Planning Practice Guidance – Flood Risk and Coastal Change, updated August 2022.
16. The National Strategy on Sea Defences, Flooding and Coastal Erosion 2016.
17. Environment Agency Coastal Flood Boundary Conditions and Island Project 2011
18. Environment Agency web based interactive maps, <http://maps.environment-agency.gov.uk>
19. Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment, October 2017;
20. Leicestershire County Council Local Flood Risk Management Strategy, August 2015;

Appendices

Appendix A



Proposed Site Plan

1:500

Printed or electronic copies of this drawing can be scaled for planning purposes only. Any discrepancies with this drawing to be reported and clarified prior to commencing work on site, if in doubt - Ask.
Corporate Architecture Ltd accept no responsibility for works not undertaken fully in accordance with this drawing and relevant specifications.
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North point:

Notes:

Zoning Legend

- New Building 12m x 37m
- New Building Perimeter Zone
- Staff / Parent Parking
- Play Area Zone (2 x 225m²)
- Animal Housing
- Animal grazing zone
- Recreational Area

LEGEND

- Site Boundary
- Gate - Lugged and braced timber gate.
- Proposed Round top Picket fence and posts.
- Line of Proposed post and rail fencing.

Revision Log:			
C	Updated to revised scheme	PG	20.05.24
B	Updated to revised scheme	TN	17.04.24
A	Updated to revised Client scheme	JB	30.11.23

Rev:	Description:	By:	Date:
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Project:
New Childcare Nursery at:
Barnhills Farm
Merrylees Road
Thornton
LE67 1AP

Client:
Mr & Mrs Gary and Amy Knight

Scale:
0 5m 10m 15m 20m 25m 1:500

Drawn by:	Checked:	Date:	Paper Size:
JB	TJN	Nov '23	A1

Drawing Title:
Proposed Site Plan

Drawing Status:
PLANNING ISSUE

Drawing Number:	Revision Number:
5681/MN/23/004	C



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Appendix B



Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus:

ELECTROMAGNETIC AND/OR GROUND PENETRATING RADAR TECHNIQUES HAVE BEEN USED TO LOCATE AND MAP UNDERGROUND UTILITIES AND FEATURES ON THIS DRAWING. CS HAVE MADE EVERY ENDEAVOR TO MAKE SURE THAT THE INFORMATION CONTAINED WITHIN THIS DRAWING IS ACCURATE AND OF THE HIGHEST QUALITY. HOWEVER, THE RESULTS FROM THESE TYPES OF SURVEYS ARE NOT INFALLIBLE AND SHOULD THE LOCATION OR DEPTH OF SERVICES/FEATURES BE OF PARTICULAR IMPORTANCE TO A PROJECT, THEN IT IS STRONGLY ADVISED THAT TRIAL EXCAVATIONS SHOULD BE UNDERTAKEN TO CONFIRM SURVEY RESULTS.

CS HAVE USED ALL RECORD DRAWINGS THAT WERE AVAILABLE TO US BY THE CLIENT OR BY THE STATUTORY
UTILITY PROVIDERS AT THE TIME OF THE SURVEY. ANY INFORMATION TAKEN FROM THESE DRAWINGS (IE PIPE SIZES,
MATERIAL) IS NOT GUARANTEED. SERVICES LOCATED FROM RECORD DRAWINGS WILL BE SHOWN AND ANNOTATED AS
TAKEN FROM RECORDS (TTR). HISTORIC RECORD INFORMATION IS OFTEN INCOMPLETE/INACCURATE AND CANNOT BE
RELIED UPON.

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m, TO EXPOSE HIDDEN SERVICES.

WHERE QUOTED, DEPTH INFORMATION OF UNDERGROUND SERVICES/FEATURES IS STATED. DEPTHS ARE GENERALLY WITHIN +/- 10% ACCURATE, BUT CANNOT BE GUARANTEED. ANY DEPTHS SHOWN ARE USUALLY TO THE TOP OF THE SERVICE/FEATURE. GRAVITY SEWERS AND DRAINS ARE USUALLY TO INVERT (BASE OF DRAINAGE CHANNEL).

CONTRACTORS UTILISING OUR DRAWINGS FOR INTRUSIVE WORK SHOULD TAKE ALL REASONABLE MEASURES TO WORK SAFELY IN ACCORDANCE WITH HSE47 GUIDELINES "AVOIDING DANGER FROM UNDERGROUND SERVICES".

PAS 128 QUALITY LEVEL CLASSIFICATIONS.

QUALITY LEVEL LABELING OF UTILITY INFORMATION BY A CLASSIFICATION CODE ALLOWS THE USER OF THIS INFORMATION TO UNDERSTAND CLEARLY HOW THE INFORMATION WAS COLLECTED AND THEN PLACE AN APPROPRIATE AMOUNT OF RELIANCE ON IT. PROJECT RISKS RELATED TO UNDERGROUND UTILITIES CAN THEN BE PROPERLY MANAGED.

QL-A INFORMATION IS OBTAINED BY EXPOSING THE UNDERGROUND UTILITY USING A NON DESTRUCTIVE EXCAVATION TECHNIQUE. THE VERTICAL INFORMATION FOR THIS LOCATING METHOD IS TO THE TOP OF THE SHALLOWEST PART OF THE LOCATED SERVICE. THE 3D LOCATION IS RECORDED AS AN X,Y,Z COORDINATE. TOLERANCES FOR QL-A CLASSIFICATION ARE +/- 50mm HORIZONTALLY AND +/- 25mm VERTICALLY.

QL B1 INFORMATION IS COLLECTED BY DESIGNATING THE HORIZONTAL AND VERTICAL LOCATION OF UNDERGROUND UTILITIES BY USING ELECTROMAGNETIC PIPE AND CABLE LOCATORS, SONDES OR FLEX TRACER, GROUND PENETRATING RADAR AND ACOUSTIC PULSE EQUIPMENT. TO OBTAIN A B1 QUALITY LEVEL MULTIPLE TECHNIQUES MUST AGREE ON THE GEOGRAPHIC POSITION.
TOLERANCES FOR B1 CLASSIFICATIONS ARE +/- 150mm HORIZONTALLY AND +/- 15% OF THE DETECTED DEPTH VERTICALLY.

UNDERGROUND UTILITIES BY USING ELECTROMAGNETIC PIPE AND CABLE LOCATORS, SONDES OR FLEXI TRACE, GROUND PENETRATING RADAR AND ACOUSTIC PULSE EQUIPMENT. TOLERANCES FOR B2 CLASSIFICATIONS ARE +/- 250MM HORIZONTALLY AND +/- 40% OF THE DETECTED DEPTH VERTICALLY.

QL B3 INFORMATION IS COLLECTED BY DESIGNATING THE HORIZONTAL LOCATION ONLY OF UNDERGROUND UTILITIES BY USING ELECTROMAGNETIC PIPE AND CABLE LOCATORS, SONDES OR FLEXI TRACE, GROUND PENETRATING RADAR AND ACOUSTIC PULSE EQUIPMENT. TOLERANCES FOR B3 CLASSIFICATIONS ARE +/- 500MM HORIZONTALLY WITH NO DEPTH GIVEN.

QL B4 INFORMATION IS ADDED AS AN ASSUMED ROUTE, THE UNDERGROUND UTILITIES HAVE BEEN UNABLE TO BE DETECTED USING ELECTROMAGNETIC PIPE AND CABLE LOCATORS, GROUND PENETRATING RADAR AND ACOUSTIC PULSE EQUIPMENT HOWEVER ARE SUSPECTED TO EXIST, THIS DATA SHOULD BE TREATED WITH CAUTION.

Q1. C INFORMATION IS COLLECTED BY CORRELATING THE SURVEY OF VISIBLE UTILITY SURFACE FEATURES SUCH AS MARKER PLATES OR MANHOLES WITH EXISTING DRAWING AND RECORD INFORMATION TO DRAW A STRING WHICH SHOWS THE APPROXIMATE POSITION OF SERVICES. THIS METHOD DOES NOT USUALLY SHOW MULTIPLE BANKS OF CABLES AND DOES NOT ALWAYS SHOW THREE DIMENSIONAL INFORMATION.

Q1. D INFORMATION IS THE MOST BASIC LEVEL OF UTILITY LOCATIONS USING ONLY INFORMATION BASED ON EXISTING UTILITY DRAWINGS AND BY MEASURING BOUNDARY OFFSETS ETC. THIS METHOD OF UTILITY LOCATION SHOULD ALWAYS BE TREATED AS AN INDICATION OF THE PRESENCE OF A SERVICE ONLY AND SHOULD NOT BE USED FOR DESIGN.

Notes:

Topographic Legend:

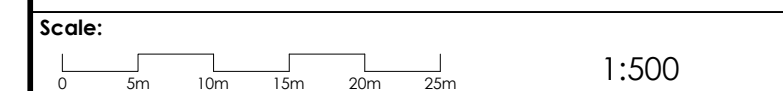
- Buildings / Walls
- Building Canopy / Overhang
- Concrete edge
- Kerb line
- Centre Line
- Barrier
- Hedge
- Security Fence
- Panel Fence
- Gate
- Overhead Line
- Tree / Sapling
- Tree Canopy Line
- Chambers

	BM	1000		Bench Mark
	TSU	1000		Temporary Bench Mark
	CL			Cover level
	IL			Invert level
	Inv D 0.25			Pipe invert (diameter)
	GU			Gully
	MH			Manhole
	IC			Inspection chamber
Tag	Tag Pipe	FB	Flag Staff	
HDG	Flag Level	MA	Gas Marker	
Level	CP	EP	Electric Post	
OPIC	Dip Level	TP	Telephone Post	
FL	Flow Level	IND	Pipe Invert	
SP	Spot Level	GU	Gully	
TBC	Control Box	RP	Roading Post	
LT	Level Ties	BT	BT Cover	
SP	Spot Post	CO	Cover Unknown	
PH	Flag Post	EC	Electric Center	
VM	Water Meter	TL	Traffic Light	
BS	Benchmark	FM	Fire Hydrant	
ECU	Electric	GAS	Gas	
BS	Bull Stop	SV	Stop Valve	

Revision Log:			
-	-	-	-
Rev:	Description:	By:	Date:

Project:
Barnhills Farm,
Merrylees Road,
Thornton,
Leicestershire,
LE67 1AP

Client:
Markfield Day Nursery



Drawn by: AO	Checked: TJN	Date: Jan '24	Paper Size: A1
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Drawing Title:			
Topographical Plan			

Drawing Status: FOR DISCUSSION

Drawing Number: 5681/MN/23/001	Revision Number: -
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Appendix C



(c) Crown copyright and database rights 2024 Ordnance Survey 100031673 Date: 22/05/24 Scale: 1:1250 Map Centre: 447230,306504 Data updated: 14/05/24 Our Ref: 1476613 - 1 Wastewater Plan A1

Do not scale off this map. The plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. Reproduction by permission of Ordnance Survey on behalf of HMSO. ©Crown Copyright and database rights 2024. All rights reserved. Ordnance Survey licence number 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

- | | | | |
|--|------------------------|---------------------------------------|---------------------------------------|
| Public Four Gravity/Lateral Drain | Highway Drain | Manhole Foul | Manhole Foul |
| Public Combined Gravity/Lateral Drain | Overflow Pipe | Manhole Surface | Manhole Surface |
| Public Surface Water Gravity/Lateral Drain | Disposal Pipe | Abandoned Pipe | Abandoned Pipe |
| Pressure Foul | Culverted Water Course | Chamber | Chamber |
| Pressure Combined | Pumping Station | Section 156 sewers are shown in green | Section 156 sewers are shown in green |
| Pressure Surface Water | Filling | Private sewers are shown in magenta | Private sewers are shown in magenta |

husna_gul@hotmail.co.uk

1101330



Appendix D

Flood Map for Planning: The Flood Map for Planning is now classed as Open Data. As such it can be downloaded free of charge under an open data licence from the following addresses:

- <https://data.gov.uk/publisher/environment-agency>
- <https://flood-map-for-planning.service.gov.uk/>

This location is within Flood Zone 2.

The flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties.
- refer to the probability of river and sea flooding.
- ignore the presence of defences,
- do not take into account potential impacts of climate change.
- This data is updated on a quarterly basis as better data becomes available.
- The NaFRA 2 will be completed Summer 2024 and the flood zones will then be updated [NaFRA2](#) (As such we are not accepting any flood map challenges at this time).

Zone 1: Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone2: Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a: High Probability	Land having a 1% (1 in 100) or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
Zone 3b: Functional Floodplain	• land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). • Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. • (Not separately distinguished from Zone 3a on the Flood Map)

Probability	Percentage chance of flooding each year
1 in 2 year	50%
1 in 5 year	20%
1 in 20 year	5%
1 in 50 year	2%
1 in 100 year	1%
1 in 1000 year	0.1%
Surface Water Flooding	
1 in 30	High Risk
1 in 100	Medium Risk
1 in 1000	Low Risk

Updated Climate Change Guidance: On 19th February 2016, the [Flood risk assessments: climate change allowances](#) was published on www.gov.uk website. It has replaced previous guidance [Climate Change Allowances for Planners](#). The climate change guidance can be found at: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

The climate change allowances for this location are:

-  **28% (central)**
-  **37% (higher central),**
-  **60% (upper)**

Modelled Information: Rothley Brook, JBA, 2022

NODE_ID	X	Y	20% (1 in 5) modelled level	20% (1 in 5) modelled flow	10% (1 in 10) modelled level	10% (1 in 10) modelled flow	5% (1 in 20) modelled level	5% (1 in 20) modelled flow
ROTH_25664	447291	306614	105.50	3.64	105.56	4.49	105.61	5.33
ROTH_25653	447297	306605	105.42	3.64	105.47	4.49	105.52	5.33
ROTH_25419	447286	306391	103.57	3.64	103.68	4.49	103.77	5.33
ROTH_25414	447288	306386	103.52	3.64	103.62	4.49	103.71	5.33

NODE_ID	X	Y	2% (1 in 50) modelled level	2% (1 in 50) modelled flow	1.3% (1 in 75) modelled level	1.3% (1 in 75) modelled flow	1% (1 in 100) modelled level	1% (1 in 100) modelled flow
ROTH_25664	447291	306614	105.68	6.59	105.72	7.23	105.74	7.65
ROTH_25653	447297	306605	105.58	6.59	105.61	7.23	105.63	7.65
ROTH_25419	447286	306391	103.90	6.59	103.96	7.23	103.99	7.65
ROTH_25414	447288	306386	103.82	6.59	103.88	7.23	103.91	7.65

NODE_ID	X	Y	0.5% (1 in 200) modelled level	0.5% (1 in 200) modelled flow	0.1% (1 in 1000) modelled level	0.1% (1 in 1000) modelled flow
ROTH_25664	447291	306614	105.80	8.82	106.31	11.67
ROTH_25653	447297	306605	105.69	8.82	105.83	11.78
ROTH_25419	447286	306391	104.08	8.81	104.33	10.20
ROTH_25414	447288	306386	103.99	8.82	104.20	11.21

NODE_ID	X	Y	1% (100 year) plus 28% CC level	1% (100 year) plus 28% CC flow	1% (100 year) plus 37% CC level	1% (100 year) plus 37% CC flow	1% (100 year) plus 60% CC level	1% (100 year) plus 60% CC flow
ROTH_25664	447291	306614	105.82	9.18	105.85	9.97	105.91	11.51
ROTH_25653	447297	306605	105.70	9.18	105.73	9.97	105.79	11.51
ROTH_25419	447286	306391	104.10	9.17	104.16	9.74	104.28	10.16
ROTH_25414	447288	306386	104.02	9.17	104.07	9.90	104.16	10.91

Please note: The flows provided represent **in channel flow only** and do not consider flow on the floodplain.

All data is discussed as metres above Ordnance Datum (mAOD). This is based on the Ordnance Datum Newlyn in Cornwall. Tide gauges have been used over time to calculate a mean sea level datum point. This point is marked as height zero on maps in Britain. For more information please see: [Ordnance Datum Newlyn reaches 100 years | Blog | Ordnance Survey](#)

Defence Information Flood defence data is routinely updated and freely available at: [AIMS Spatial Flood Defences \(inc. standardised attributes\) - data.gov.uk](#) and [AIMS Asset Bundle - data.gov.uk](#).

There are no Environment Agency maintained raised defences in this area.

Historic Information: We have no records of historic fluvial flooding at this location. However, we would advise that this does not mean there has never been historic flooding in this location or that the area is automatically free from a risk of flooding. We do not claim that all flood events have been recorded.

Surface Water & Drainage: The Environment Agency (empowered under the Water Resources Act 1991) concentrates on the major elements of the drainage system, managing flood risk arising from designated "main rivers" and the sea. The Flood & Water Management Act (2010) has given Lead Local Flood Authorities (LLFAs) responsibility for the management of local flood risk, which includes surface runoff, groundwater, and flooding from ordinary watercourses (smaller rivers and streams). The LLFA for this area is **Leicestershire County Council**, and we recommend that you contact them with concerns about any flooding issues for this area.

Further information and maps for surface water, ordinary watercourses, and reservoir flooding can be found here: <https://www.gov.uk/check-long-term-flood-risk> ; [Reservoir flood maps: when and how to use them - GOV.UK \(www.gov.uk\)](#)

Open Data Information: Many datasets are now classed as Open Data and as such can be downloaded free of charge under an open data licence from the following address: <https://data.gov.uk/publisher/environment-agency>

Permitting Information: Under the Environmental Permitting (England and Wales) Regulations 2016, any permanent or temporary works in, over or under a designated main river will require an Environmental Permit for Flood Risk Activities from the Environment Agency. Any permanent or temporary works within 8 metres of the top of bank of a designated main river, or landward toe of a flood defence may require an Environmental Permit for Flood Risk Activities from the Environment Agency. In addition, any permanent or temporary works within the floodplain of a designated main river may also require an Environmental Permit for Flood Risk Activities. To find out whether your activity requires a permit or falls under a relevant exclusion, exemption or standard rule please follow this link: <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>. The Environment Agency require access to the watercourse and free movement up to 8m from the river bank/ defence for maintenance purposes.

Please note that a permit is separate to and in addition to any planning permission granted.

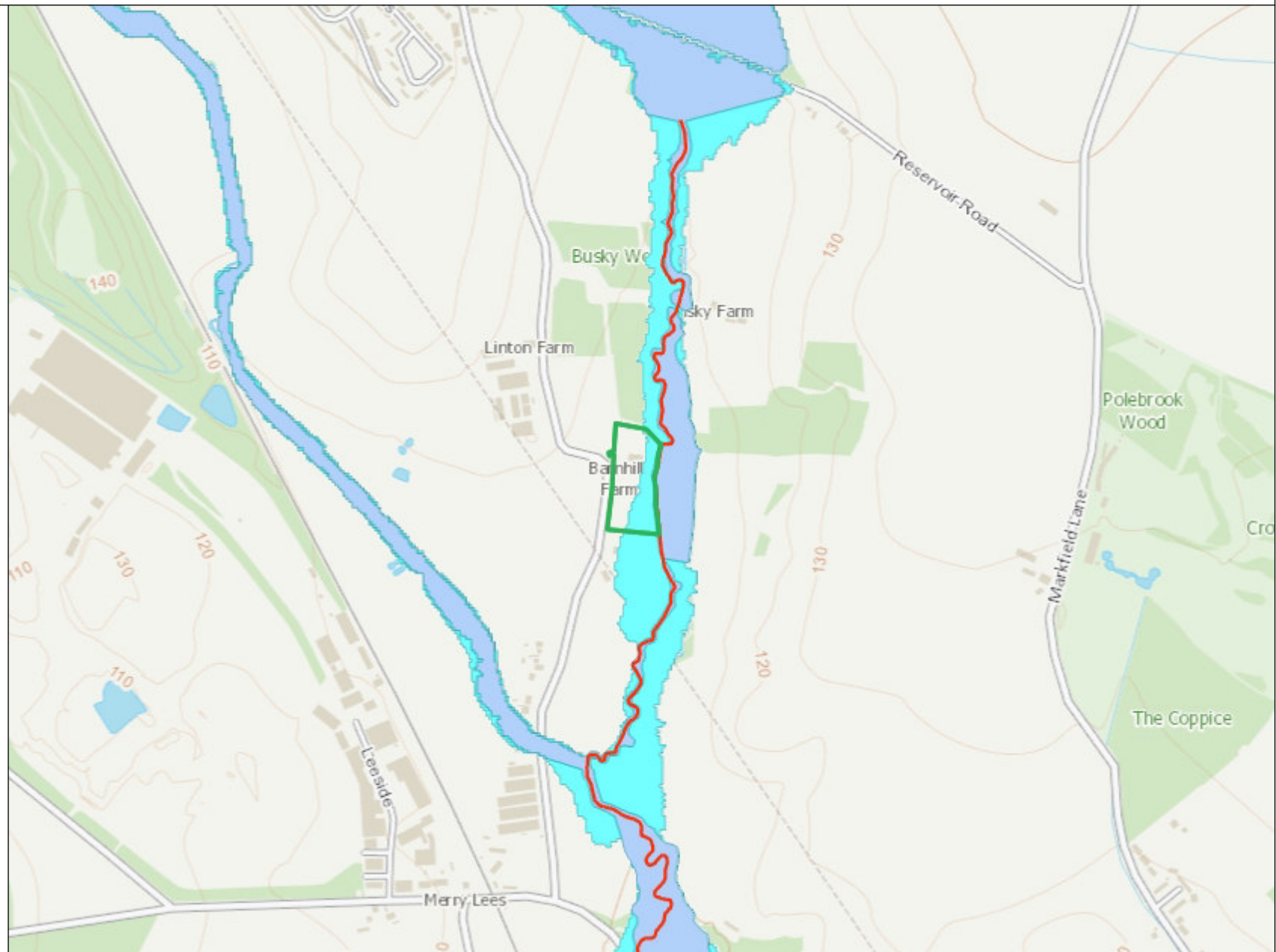
Strategic flood risk assessments: We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site-specific flood risk assessment. This should give you information about the potential impacts of climate change in this catchment areas defined as functional floodplain flooding from other sources, such as surface water, ground water and reservoirs. This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood Risk Assessment Advisory: All guidance on how to complete a full site specific Flood Risk Assessment (FRA) can be found here: [Flood risk and coastal change - GOV.UK \(www.gov.uk\)](#). Furthermore, information on how to use modelling for FRA's can be found here: [Using modelling for flood risk assessments - GOV.UK \(www.gov.uk\)](#). In addition, professional assistance can be provided by our planning officers, by contacting planning.trentside@environment-agency.gov.uk.

Detailed Flood Map, centred on Merrylees Road, Thornton [EMD 355169]

Legend

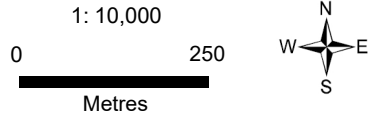
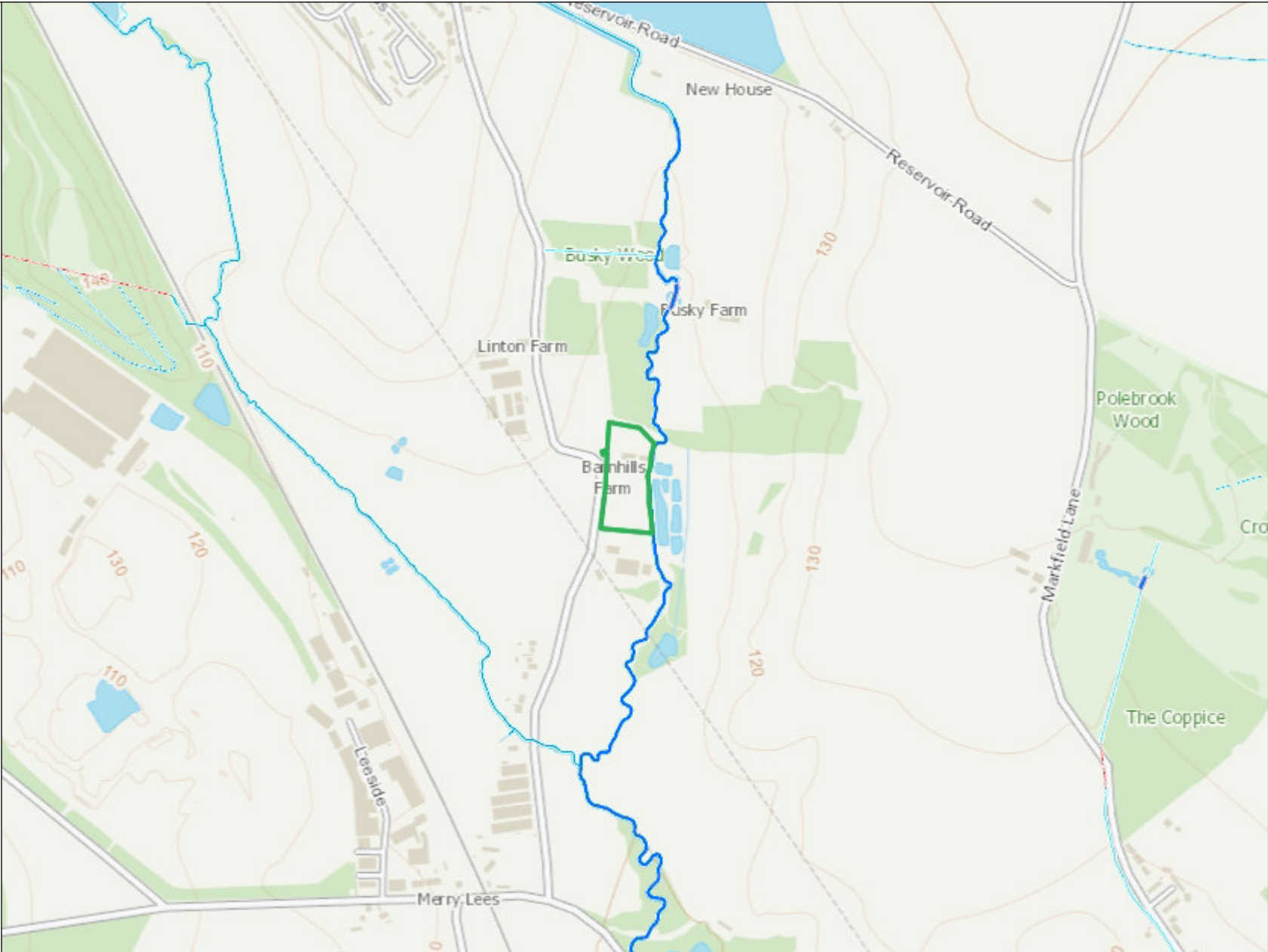
- Statutory Main Rivers
- - - Defences
- Flood Storage Areas
- Flood Zone 3
- Flood Zone 2



Detailed River Network Map, centred on Merrylees Road, Thornton [EMD 355169]



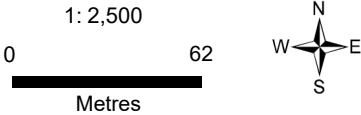
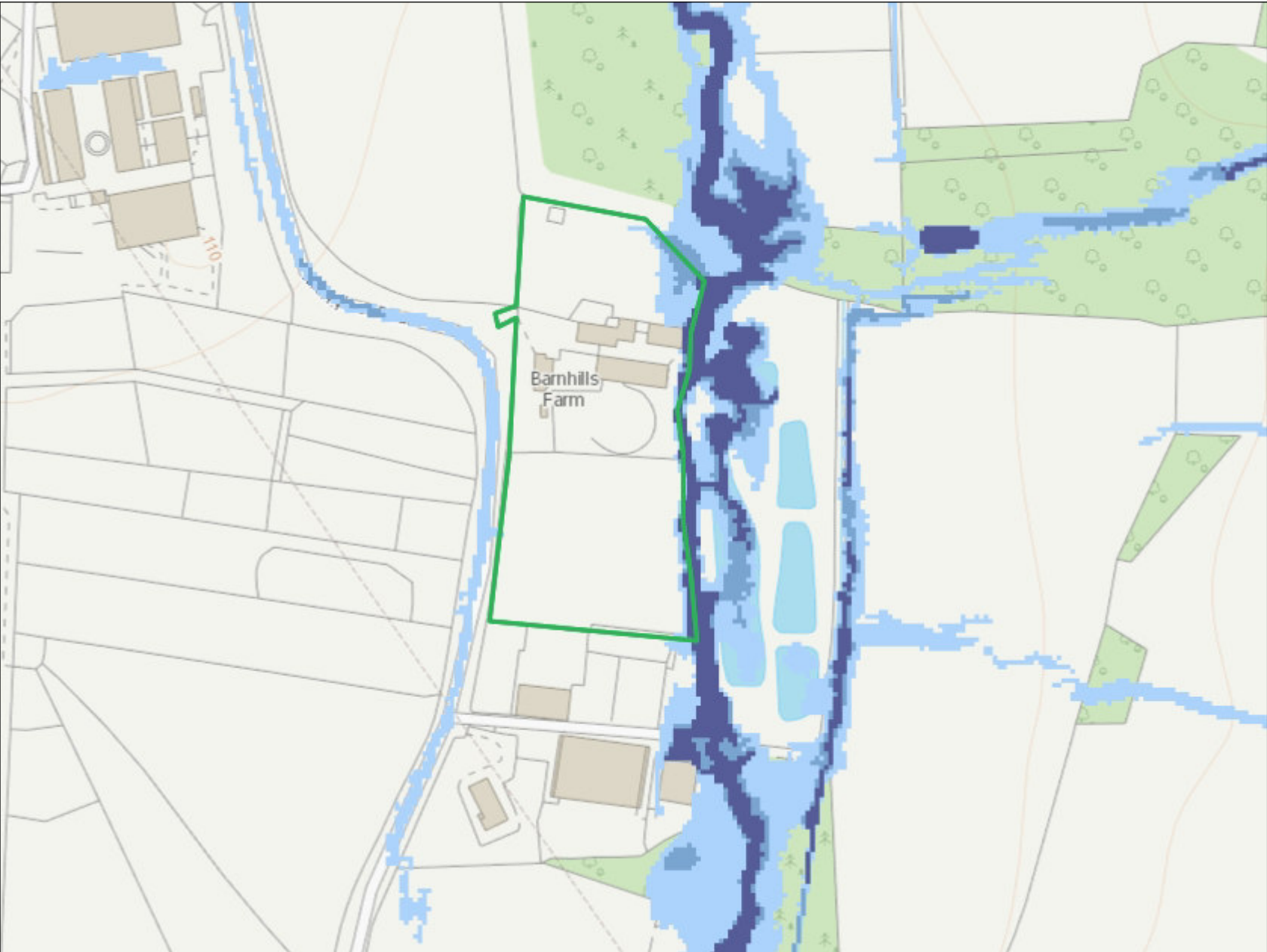
- Legend
- Detailed River Network
- Primary River
 - Secondary River
 - Tertiary River
 - Lake / Reservoir
 - Canal
 - Canal Tunnel
 - Extended Culvert
 - Multiple Channel Culvert
 - Underground River (potential sewer)
 - Underground River (inferred)
 - Underground River (local knowledge)
 - Undefined
- Offline Drainage features
- Detailed River Network
- Primary River
 - Secondary River
 - Tertiary River
 - Lake / Reservoir
 - Canal
 - Canal Tunnel
 - Extended Culvert
 - Multiple Channel Culvert
 - Underground River (potential sewer)
 - Underground River (inferred)
 - Underground River (local knowledge)
 - Undefined



Surface Water Map, centred on Merrylees Road, Thornton [EMD 355169]



- Legend
- Flood Extent 1 in 30
 - Flood Extent 1 in 100
 - Flood Extent 1 in 1000



Modelled Nodes Map, centred on Merrylees Road, Thornton [EMD 355169]



Scale 1:5,000

Date created: 11 April 2024

Legend

● Modelled_nodes_Rothley Brook

ROTH_26119

ROTH_25979 ROTH_25977

ROTH_25939d ROTH_25926

ROTH_25940 ROTH_25939

ROTH_25736

ROTH_25664 ROTH_25653

ROTH_25664d

ROTH_25419 ROTH_25414

ROTH_25419u

ROTH_25334

ROTH_25247

ROTH_25137

ROTH_25019d ROTH_25019

SOURCE:
Rothley Brook, JBA, 2022

Modelled Flood Extents Map, centred on Merrylees Road, Thornton [EMD 355169]



Scale 1:2,500

Date created: 11 April 2024

Modelled Flood Extents

- 1 in 2 year extent
- 1 in 5 year extent
- 1 in 10 year extent
- 1 in 20 year extent
- 1 in 30 year extent
- 1 in 50 year extent
- 1 in 75 year extent
- 1 in 100 year extent
- 1 in 200 year extent
- 1 in 1000 year extent

SOURCE:

Rothley Brook, JBA, 2022

Floodplain Heights Map, centred on Merrylees Road, Thornton [EMD 355169]

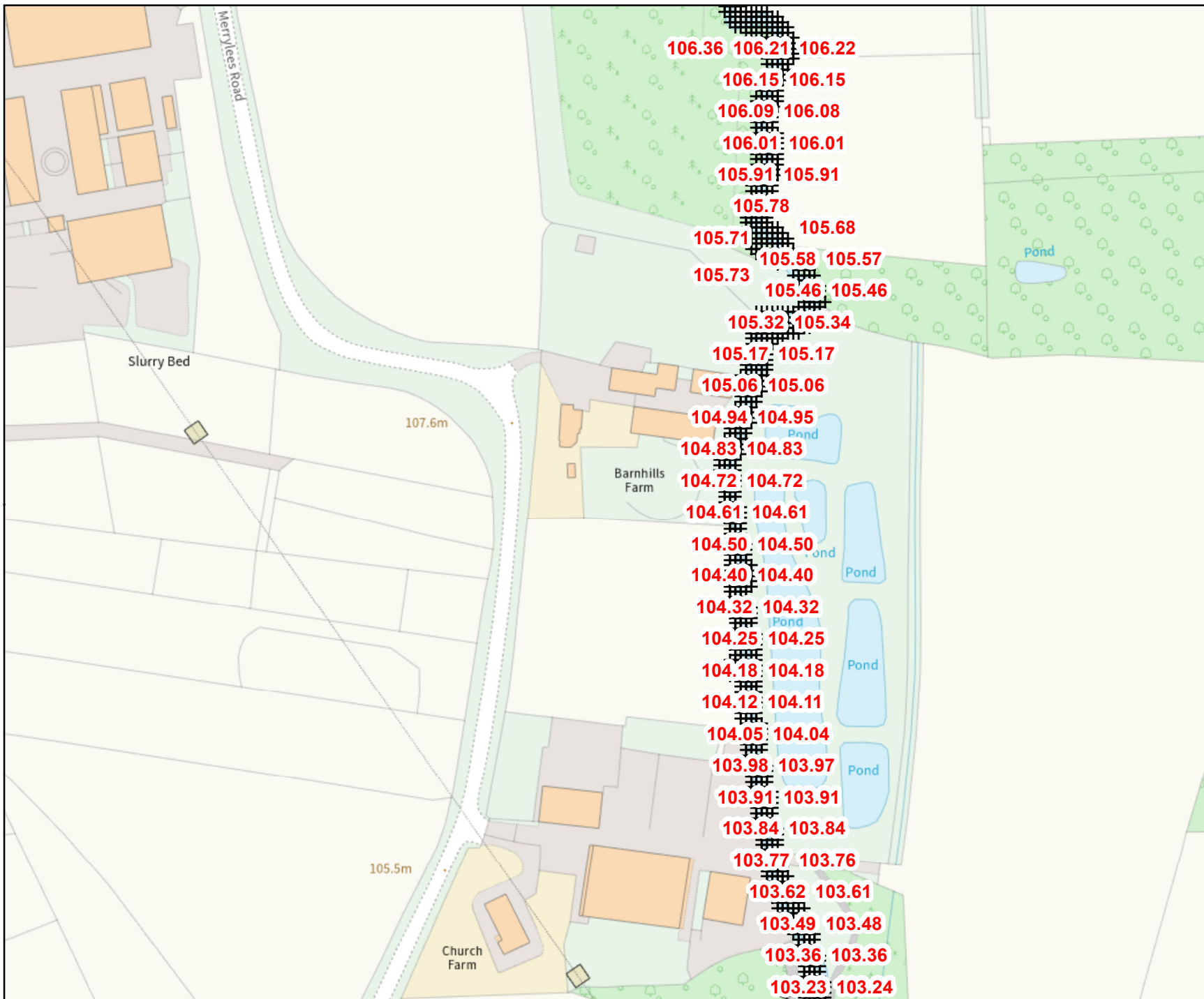


Scale 1:2,000

Date created: 11 April 2024

Legend

+ 1 in 30yr Height (mAOD)



SOURCE:

Rothley Brook, JBA, 2022

Floodplain Heights Map, centred on Merrylees Road, Thornton [EMD 355169]



Scale 1:2,000

Date created: 11 April 2024

Legend

+ 1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

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1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

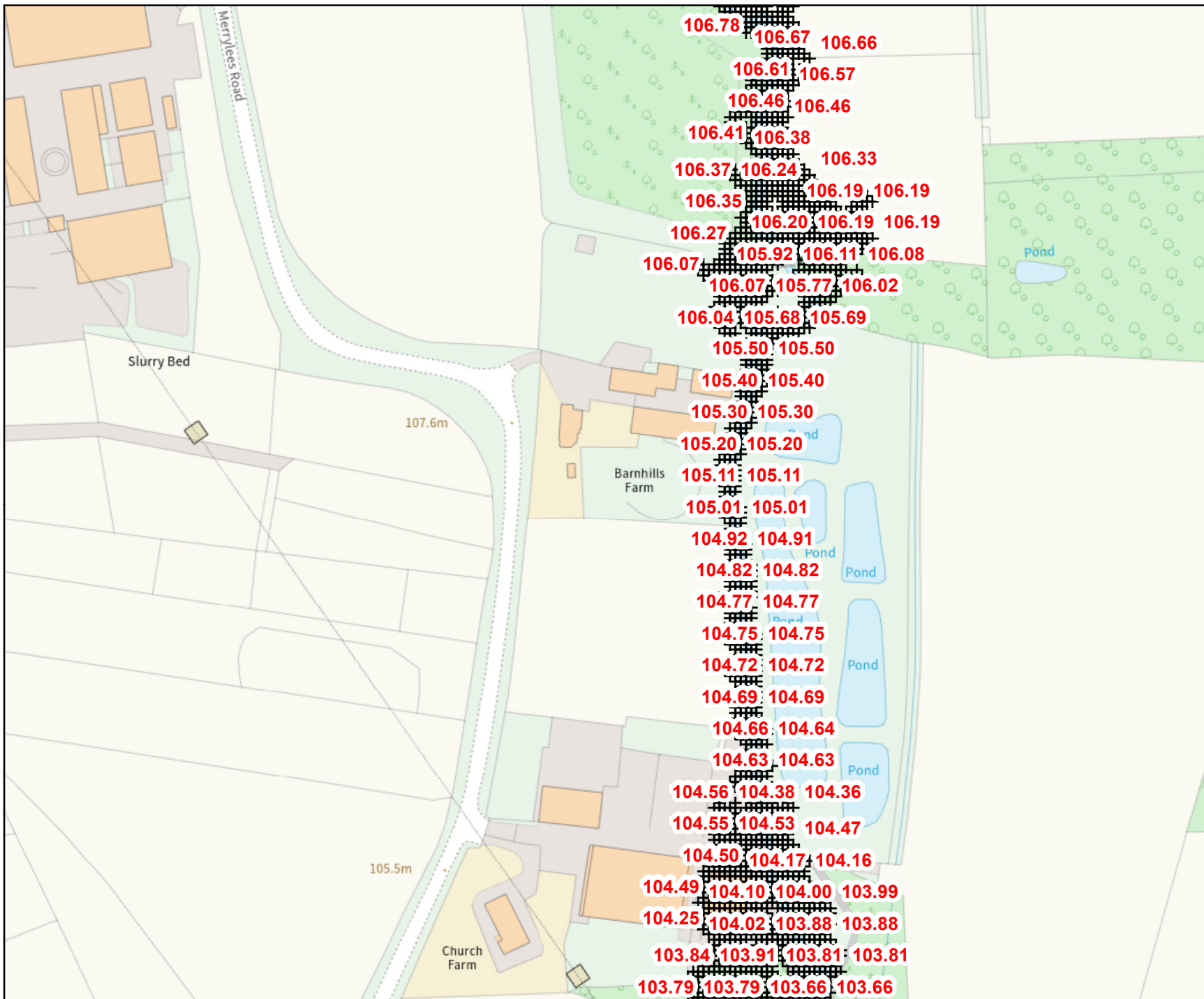
1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

1 in 1000yr Height (mAOD)

SOURCE:

Rothley Brook, JBA, 2022



Modelled Flood Extents Map, centred on Merrylees Road, Thornton [EMD 355169]



Scale 1:2,500

Date created: 11 April 2024

Legend

- 1 in 100 year + central CC extent
- 1 in 100 year + higher central CC extent
- 1 in 100 year + upper CC extent

Barnhills
Farm

SOURCE:
Rothley Brook, JBA, 2022

Floodplain Heights Map, centred on Merrylees Road, Thornton [EMD 355169]

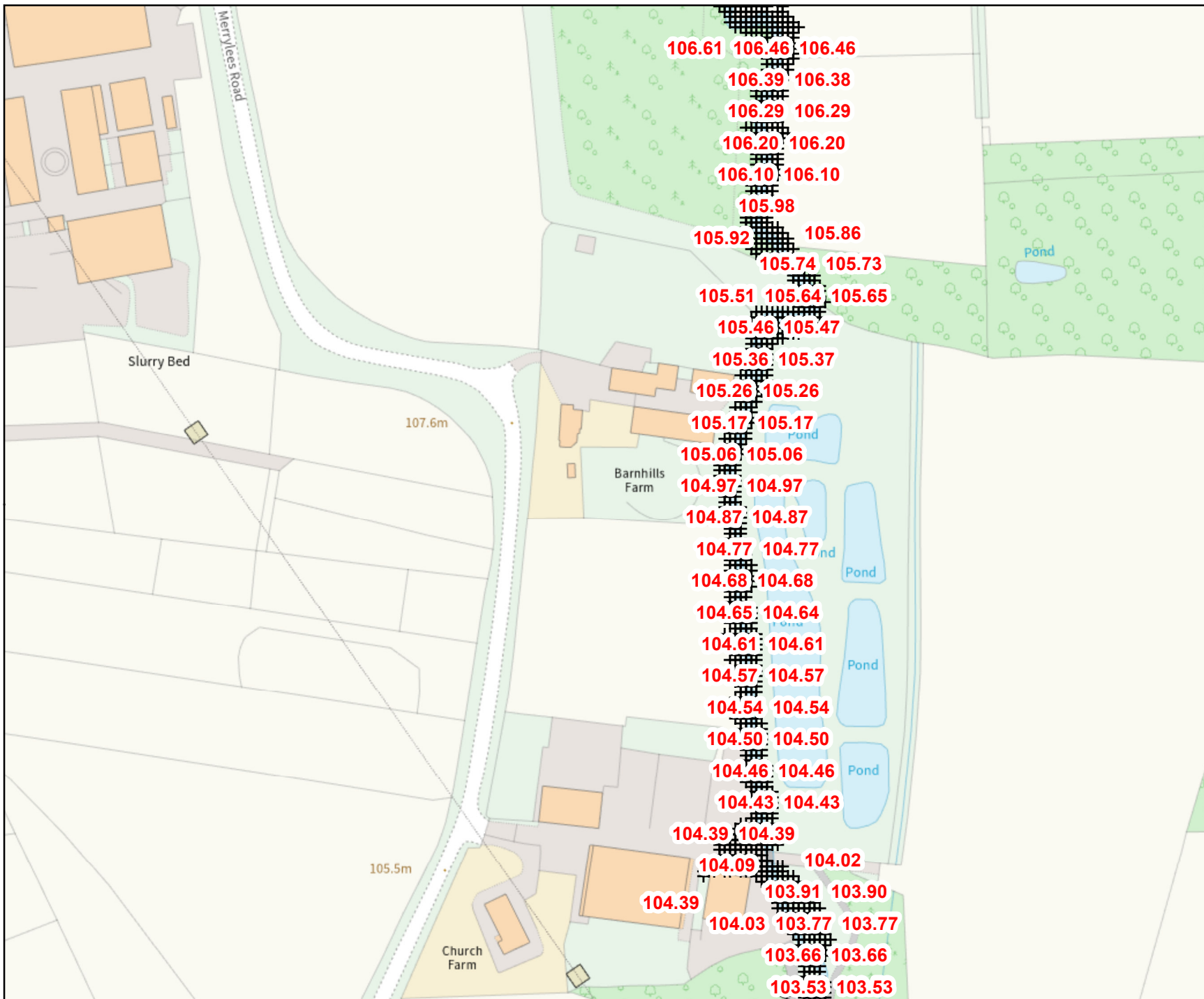


Scale 1:2,000

Date created: 11 April 2024

Legend

+ 1 in 100yr +30%CC Height (mAOD)



SOURCE:

Rothley Brook, JBA, 2022

Floodplain Heights Map, centred on Merrylees Road, Thornton [EMD 355169]

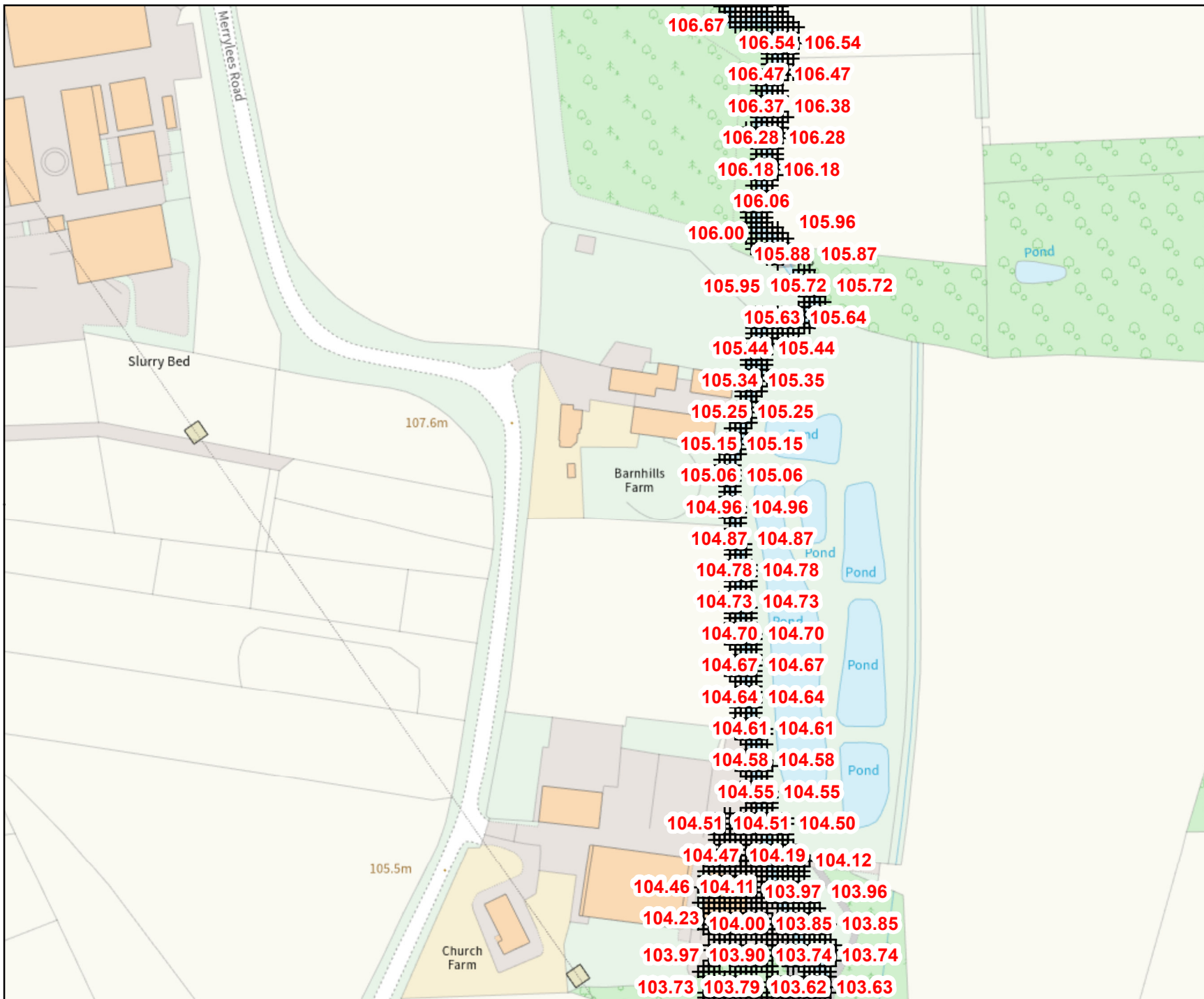


Scale 1:2,000

Date created: 11 April 2024

Legend

+ 1 in 100yr +50%CC Height (mAOD)



SOURCE:
Rothley Brook, JBA, 2022

Appendix E

Calculated by:	Ivayla Dimitrov
Site name:	
Site location:	

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

Site Details

Latitude:	52.65681° N
Longitude:	1.30416° W
Reference:	310811861
Date:	May 23 2024 12:18

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.25
-----------------------	------

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

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

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

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

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

Hydrological
characteristics

	Default	Edited
SAAR (mm):	672	672
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 30 years:	2	2
Growth curve factor 100 years:	2.57	2.57
Growth curve factor 200 years:	3.04	3.04

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

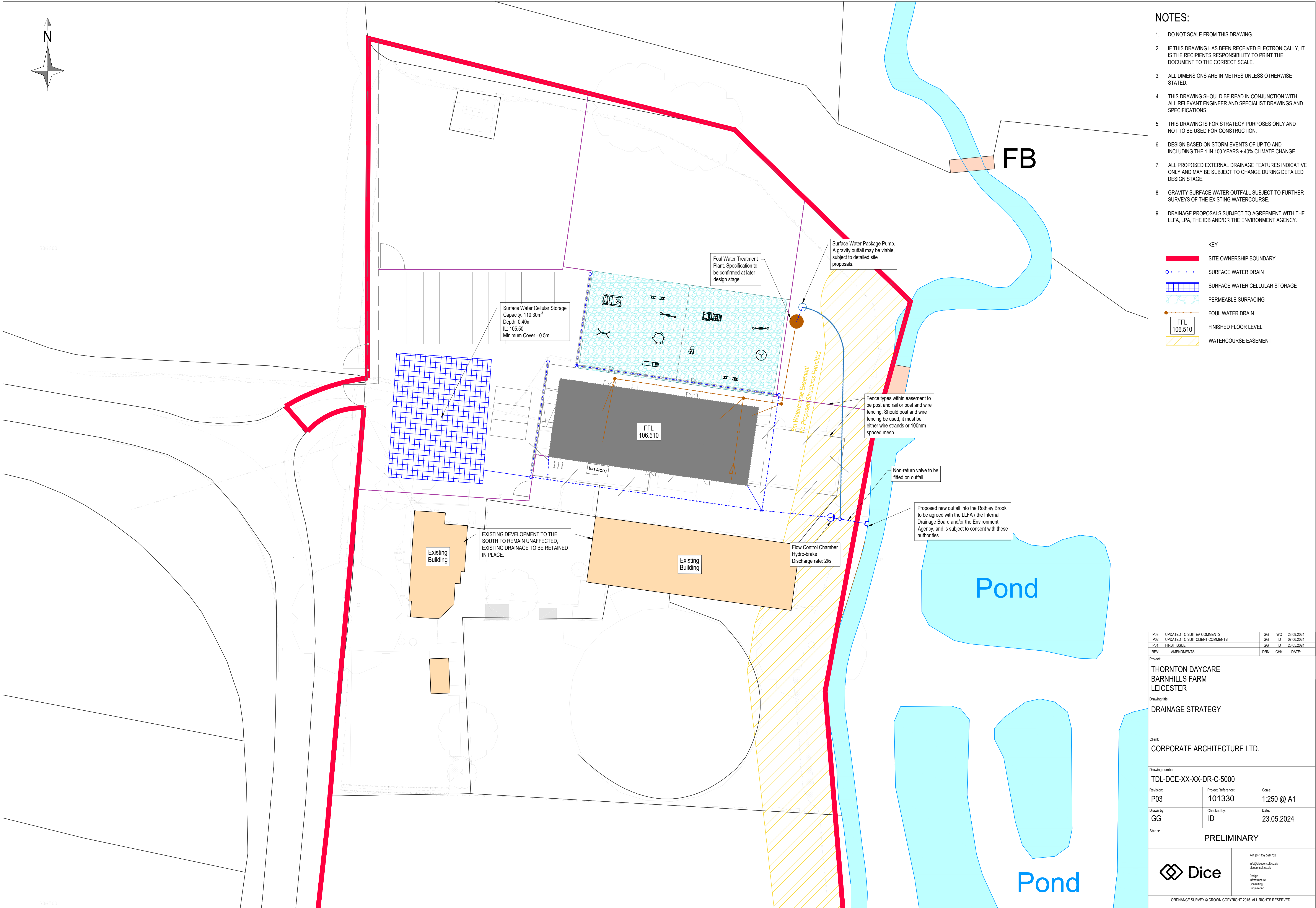
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	1.15	1.15
1 in 1 year (l/s):	0.96	0.96
1 in 30 years (l/s):	2.3	2.3
1 in 100 year (l/s):	2.96	2.96
1 in 200 years (l/s):	3.5	3.5

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

Appendix F



1. DO NOT SCALE FROM THIS DRAWING.
2. IF THIS DRAWING HAS BEEN RECEIVED ELECTRONICALLY, IT IS THE RECIPIENT'S RESPONSIBILITY TO PRINT THE DOCUMENT TO THE CORRECT SCALE.
3. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
4. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEER AND SPECIALIST DRAWINGS AND SPECIFICATIONS.
5. THIS DRAWING IS FOR STRATEGY PURPOSES ONLY AND NOT TO BE USED FOR CONSTRUCTION.
6. DESIGN BASED ON STORM EVENTS OF UP TO AND INCLUDING THE 1 IN 100 YEARS + 40% CLIMATE CHANGE.
7. ALL PROPOSED EXTERNAL DRAINAGE FEATURES INDICATIVE ONLY AND MAY BE SUBJECT TO CHANGE DURING DETAILED DESIGN STAGE.
8. GRAVITY SURFACE WATER OUTFALL SUBJECT TO FURTHER SURVEYS OF THE EXISTING WATERCOURSE.
9. DRAINAGE PROPOSALS SUBJECT TO AGREEMENT WITH THE ULFA, LPA, THE IDB AND/OR THE ENVIRONMENT AGENCY.

	SITE OWNERSHIP BOUNDARY
	SURFACE WATER DRAIN
	SURFACE WATER CELLULAR STORAGE
	PERMEABLE SURFACING
	FOUL WATER DRAIN
	FINISHED FLOOR LEVEL
	WATERCOURSE EASEMENT

P03 UPDATED TO SUIT EA COMMENTS		GG	WO	23.09.2024
P02 UPDATED TO SUIT EA COMMENTS		GG	ID	07.06.2024
P01 FIRST ISSUE		GG	ID	23.05.2024
REV: AMENDMENTS:		DRN	CHK	DATE:
Project:				
THORNTON DAYCARE BARNHILLS FARM LEICESTER				
Drawing title:				
DRAINAGE STRATEGY				
Client:				
CORPORATE ARCHITECTURE LTD.				
Drawing number:				
TDL-DCE-XX-XX-DR-C-5000				
Revision:		Project Reference:		Scale:
P03		101330		1:250 @ A1
Drawn by:		Checked by:		Date:
GG		ID		23.05.2024
Status:				
PRELIMINARY				
 Dice		+44 (0) 1159 528 752		
		info@diceconsult.co.uk diceconsult.co.uk		
		Design Infrastructure Consulting Engineering		
ORDNANCE SURVEY © CROWN COPYRIGHT 2015. ALL RIGHTS RESERVED.				

Appendix G

Borehole Log

Borehole ref: RDM1193/WSBH1		Project Name: Coalville		Client: Amy Knight		Project Number: RDM 1193	
Address: Land at Barnhills Farm, Merrylees Rd, Thornton				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 22/04/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 18/04/2024		Depth of bore (m) 5		Diameter (mm) 115	
Elevation	n/a	Backfilled	yes	G/water depth(m) First/Last: 0.92 / 0.43			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	70					Brown day FILL with cobbles	0.2
						Brown silty CLAY with pebbles	0.3
1							
		33	1.15 - 1.45			Brown low to medium dense SAND & GRAVELS slightly claybound. Gravel is fine to coarse rounded and sub-rounded chert and flint (RIVER TERRACED SAND & GRAVELS)	2
U2	70						
2							
		14	2.15 - 2.45				
U3	80					PROBED due to borehole collapse at 1.6m. Data consistent with firm weathered mudstone surface	2.5
3							
4							
5							

Key:




Clays
Sands




Topsoil
Fill




Other




G/W Struck
G/W Last

RDM
Environmental and Geotechnical
Engineering Ltd

Borehole Log

Borehole ref: RDM1193/WSBH2		Project Name: Coalville		Client: Amy Knight		Project Number: RDM 1193	
Address: Land at Barnhills Farm, Merrylees Rd, Thornton				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 22/04/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 22/04/2024		Depth of bore (m) 4		Diameter (mm) 115	
Elevation n/a		Backfilled yes		G/water depth(m) First/Last: 1.49 / 1.31			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	80					Brown day FILL with cobbles	0.2
1		7	1.15 - 1.45			Brown low to medium dense SAND & GRAVELS slightly claybound. Gravel is fine to coarse rounded and sub-rounded chert and flint (RIVER TERRACED SAND & GRAVELS)	1.3
U2	80					Firm reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse rounded and sub-rounded chert and flint (GUNTHORPE MUDSTONE)	2.5
2		15	2.15 - 2.45				
U3	90						
3		17	3.15 - 3.45				
U4	90						
4		27	4.15 - 4.45				

Key:

 Clays

 Sands

 Topsoil

 Fill

 Limestone/Chalk

 Other

 G/W Struck

 G/W Last

RDM
Environmental and Geotechnical
Engineering Ltd

Borehole Log

Borehole ref: RDM1193/WSBH3		Project Name: Coalville		Client: Amy Knight		Project Number: RDM 1193	
Address: Land at Barnhills Farm, Merrylees Rd, Thornton				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 22/04/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 22/04/2024		Depth of bore (m) 5		Diameter (mm) 115	
Elevation	n/a	Backfilled	yes	G/water depth(m) First/Last: 1.67 / 1.32			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	80					Brown clay FILL with gravel	0.2
						Brown silty CLAY with pebbles	0.4
U2	90	20	1.15 - 1.45			Brown low to medium dense SAND & GRAVELS slightly claybound. Gravel is fine to coarse rounded and sub-rounded chert and flint (RIVER TERRACED SAND & GRAVELS)	1.4
U3	90	14	2.15 - 2.45			Firm reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse rounded and sub-rounded chert and flint (GUNTHORPE MUDSTONE).	1
						PROBED from 3.00m with no inconsistency	2

Key:

Clays

Sands

Topsoil

Fill

Limestone/Chalk

Other

G/W Struck

G/W Last

RDM

Environmental and Geotechnical Engineering Ltd

Borehole Log

Borehole ref: RDM1193/WSBH4		Project Name: Coalville		Client: Amy Knight		Project Number: RDM 1193	
Address: Land at Barnhills Farm, Merrylees Rd, Thornton				Drilling contractor: Cowan Drilling Ltd		Drill rig type Window Sampler	
Logged by: R Gray		Started 22/04/2024		Hammer 63.5kg		Hammer Drop 760mm	
Driller J Hogg		Completed 22/04/2024		Depth of bore (m) 4		Diameter (mm) 115	
Elevation	n/a	Backfilled	yes	G/water depth(m) First/Last: 2.8 / 1.76			

Depth (m) Sample No	% Ret'd	N Val	SPT Depth (m)	Legend	G/water	Description	Field Notes/Thickness
U1	80					Brown TOPSOIL grass over	0.4
1		8	1.15 - 1.45			Brown low to medium dense SAND & GRAVELS slightly claybound. Gravel is fine to coarse rounded and sub-rounded chert and flint (RIVER TERRACED SAND & GRAVELS)	1
U2	90					Firm reddish brown slightly gravelly slightly sandy CLAY. Gravel is fine to coarse rounded and sub-rounded chert and flint (GUNTHORPE MUDSTONE).	2.6
2		16	2.15 - 2.45				
U3	80						
3		16	3.15 - 3.45				
U4	80						
4		24	4.15 - 4.45				

Key:

 Clays

 Sands

 Topsoil

 Fill

 Limestone/Chalk

 Other

 G/W Struck

 G/W Last

RDM
Environmental and Geotechnical
Engineering Ltd

Appendix H

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.150	5.00	10.000	600	1.000	1.000	1.425
2	0.051	5.00	10.000	600	11.000	11.000	1.509
3			10.000	1200	22.000	22.000	1.601

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	14.142	0.600	8.575	8.491	0.084	168.4	225	5.23	50.0
1.001	2	3	15.556	0.600	8.491	8.399	0.092	169.1	225	5.49	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.005	39.9	20.3	1.200	1.284	0.150	0.0	114	1.009
1.001	1.002	39.9	27.2	1.284	1.376	0.201	0.0	137	1.077

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	14.142	168.4	225	Circular	10.000	8.575	1.200	10.000	8.491	1.284
1.001	15.556	169.1	225	Circular	10.000	8.491	1.284	10.000	8.399	1.376

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	600	Manhole	Adoptable	2	600	Manhole	Adoptable
1.001	2	600	Manhole	Adoptable	3	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	1440
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	35	0	0
100	40	0	0

Node 3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	8.399	Product Number	CTL-SHE-0075-2000-0500-2000
Design Depth (m)	0.500	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	8.491
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	520

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	275.5	0.0	0.400	275.5	0.0	0.401	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	8	8.839	0.264	21.2	0.6308	0.0000	SURCHARGED
180 minute winter	2	136	8.558	0.067	7.0	18.5609	0.0000	OK
120 minute winter	3	102	8.575	0.176	5.2	0.1989	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	24.5	1.647	0.612	0.2848	
180 minute winter	2	1.001	3	5.0	0.282	0.126	0.3235	
120 minute winter	3	Hydro-Brake®		2.0				26.0

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	9.099	0.524	70.1	1.2507	0.0000	SURCHARGED
240 minute winter	2	236	8.770	0.279	17.5	77.2672	0.0000	SURCHARGED
240 minute winter	3	236	8.770	0.371	5.0	0.4199	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	69.8	2.311	1.747	0.4279	
240 minute winter	2	1.001	3	5.0	0.240	0.124	0.6187	
240 minute winter	3	Hydro-Brake®		2.0				99.2

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	9.402	0.827	94.3	1.9738	0.0000	SURCHARGED
360 minute winter	2	352	8.891	0.400	17.1	110.4457	0.0000	SURCHARGED
360 minute winter	3	352	8.890	0.491	5.4	0.5555	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	93.6	2.847	2.342	0.5140	
360 minute winter	2	1.001	3	5.4	0.267	0.136	0.6187	
360 minute winter	3	Hydro-Brake®		2.0				146.2

