



# MEC

Development Technical  
Consultants

# FLOOD RISK & DRAINAGE



**Barton Lane, Congerstone**  
Flood Risk Assessment  
December 2023

**Report Ref: 28212-FLD-0101 REV A**

# Barton Lane, Congerstone Flood Risk Assessment December 2023

REPORT REF: 28212-FLD-0101 REV A

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## REGISTRATION OF AMENDMENTS

| Date           | Rev | Comment                             | Prepared By                                                                        | Checked By                                                     | Approved By                                           |
|----------------|-----|-------------------------------------|------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------|
| September 2023 | -   | First issue                         | <b>Zoe Jordan,</b><br><b>BSc (Hons)</b><br>Assistant Flood Risk Engineer           | <b>Ryan Chafer</b><br><b>BSc (Hons)</b><br>Flood Risk Engineer | <b>Tim Rose</b><br><b>BA (Hons), MTPS</b><br>Director |
| December 2023  | A   | Updates including Drainage Strategy | <b>Ben Oyston,</b><br><b>MSc (Hons) BSc (Hons)</b><br>Graduate Flood Risk Engineer | <b>Ryan Chafer</b><br><b>BSc (Hons)</b><br>Flood Risk Engineer | <b>Tim Rose</b><br><b>BA (Hons), MTPS</b><br>Director |

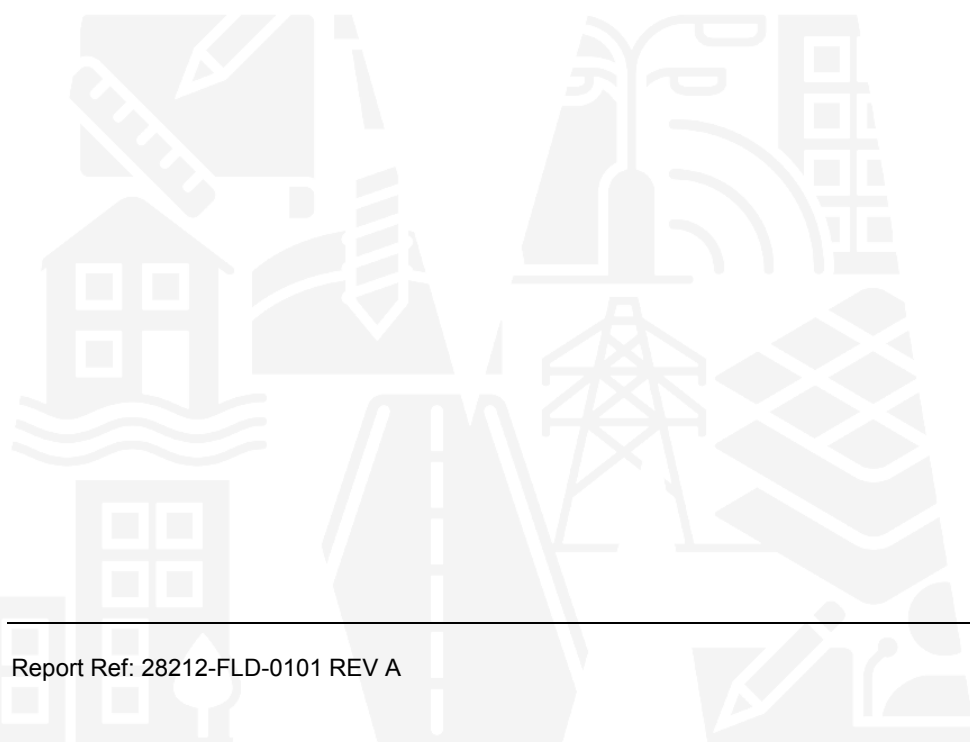
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## EXECUTIVE SUMMARY

|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site Address</b>                                                         | Barton Lane, Congerstone, CV13 6NB, E:437018, N:305645                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Site Description and Setting</b>                                         | The site currently consists of greenfield land and is bordered to the north and east by agricultural fields and the River Sence, to the south by Barton Lane, and to the west by Chapel Lane and associated dwellings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Proposed Development</b>                                                 | The proposed development will comprise of approximately 20 dwellings with associated infrastructure, parking and access to Barton Lane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Fluvial Flood Risk and Mitigation Measures</b>                           | <p>91% of the proposed development is located within Flood Zone 1. The remaining 9% of the site is located within Flood Zone 2 and 3.</p> <p>In lieu of Product 4 information, the Flood Map for Planning extents have been plotted against the topographical survey. Using the 0.1% AEP flood extent, an assessment of the proposed 1% AEPCC flood level was made for the site. Flooding for the 0.1% AEP would likely reach levels of up to 88.0m AOD on site and as such, it is estimated that the flood level for the 1% AEPCC will reach up to 88.0m AOD. Finished floor levels should be set to a minimum of 88.30m AOD (300mm above the 1% AEPCC event) with flood resilience measures set 300mm the finished floor level above, i.e., 88.60m AOD.</p> <p>It is recommended that property owners sign up for flood alerts with the Environment Agency.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Surface Water Flood Risk and Mitigation Measures</b>                     | <p>The Environment Agency Flood Risk from Surface Water Map indicates that the site is generally at very low risk of surface water flooding. There is an area at low to high flood risk towards the northern boundary of the site due to the tributary flowing into the River Sence. Flooding on site would reach depths of up to 900mm with a velocity of up to 1m/s. The maximum hazard rating is 'danger to some'.</p> <p>It is recommended that the proposed development is located out of areas at high risk of surface water flooding.</p> <p>Safe access and egress should also be considered when appraising the residual risk posed by all sources of flooding. The proposed development will have one access road in and out of the site, which is unaffected by fluvial or surface water flooding. However, Barton Lane is affected by surface water flooding from the 0.1%, 1% and 3.3% AEP flood events.</p> <p>It is recommended that access and egress is taken from the south during flood events, as the hazard rating is lower. Emergency vehicles can travel in flood waters up to 1m deep, and fire engines remain controllable in depths of 0.5m. Therefore, in an emergency, the local emergency services would be able to reach the proposed development, from the south of the development. Land to the north may become impassible during high surface water flooding events.</p> |
| <b>Flood Risk and Mitigation Measures for all other sources of flooding</b> | <p>Ashby de la Zouch Canal is located 205m southeast of the site. Canals do not generally pose a direct flood risk as they are a regulated waterbody, which usually plays a pivotal role in reducing flood risk. However, there is a residual risk from lower probability events such as overtopping or embankment failure.</p> <p>There is a medium risk of groundwater flooding within the development site. Groundwater monitoring should be undertaken prior to development and if groundwater is discovered, attenuation features should be lined to prevent groundwater seepage.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Surface Water Drainage Strategy</b>                                      | <p>In accordance with the drainage hierarchy surface water runoff generated at the site will be conveyed, stored and treated within the proposed attenuation basin at the site. Surface water stored within the proposed attenuation basin will discharge into the existing Tributary of the River Sence, to the north of the site at a discharge rate of 5.0l/s.</p> <p>A total storage volume of 375.21m<sup>3</sup> will be available within the proposed attenuation basin to manage flows generated for events up to and including the 1% AEP40CC event.</p> <p>Additional measures such as permeable paving will also be used to convey and store surface waters on site.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Foul Water Drainage Strategy</b>                                                                                                                                                  | <p>Sewer records obtained from Severn Trent Water shows there is a 150mm Combined Sewer flowing northeast to southwest along Barton Lane south of the site.</p> <p>Foul water flows from the site will be discharged via gravity to the combined sewer along Barton Lane into MH0501, subject to agreement with Severn Trent Water.</p> <p>The peak foul rate arising as a result of the development has been estimated at approximately 1.0l/s, assuming a foul load rate of 0.05l/s.</p> |
| <b>Conclusions</b>                                                                                                                                                                   | <p>With the above measures in place, the development of the site will not create any flood risk issues for the wider area.</p>                                                                                                                                                                                                                                                                                                                                                             |
| <p><b>This summary should be read in conjunction with the full report and reflects an assessment of the site based on information received by MEC at the time of production.</b></p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |



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## 1.0 INTRODUCTION

- 1.1 MEC, has been commissioned by Naylors Estate Agents (hereafter referred to as ‘the Client’) to undertake a Flood Risk Assessment for a proposed residential development at Barton Lane, Congerstone (hereafter referred to as ‘the Site’). A site location plan is provided in **Appendix A** and a sketch masterplan is contained within **Appendix B**.
- 1.2 The proposed development will comprise of approximately 20 dwellings with associated infrastructure, parking and access to Barton Lane. The proposed development will take place on existing greenfield land and is centred on OS grid reference E:437018, N:305645. The total site measures 1.18ha.
- 1.3 The assessment has been undertaken to ascertain the constraints of the development to the site and to assess the impact of the design, concerning flood risk.
- 1.4 The Flood Risk Assessment has been carried out in accordance with the requirements of the documents below. See **Appendix C** for additional policies and references.
- National Planning Policy Framework (NPPF)
  - National Planning Practice Guidance on Flood Risk & Coastal Change (PPG)
  - Environment Agency Flood Risk Standing Advice
  - Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment (October 2017)
  - Strategic Flood Risk Assessment for Hinckley and Bosworth Borough Council (July 2019)
- 1.5 The Local Planning Authority (LPA) is Hinckley and Bosworth Borough Council and the Lead Local Flood Authority (LLFA) is Leicestershire County Council (LCC). The site falls within the Severn Trent Water (STW) Catchment.
- 1.6 This updated FRA Report (Revision A) addresses the comments raised by the LLFA and Environment Agency. These responses can be seen in **Appendix K**.

1.7 The assessment has been prepared using our best engineering judgement however there are levels of uncertainty implicit in the historical data and methods of analysis. The report is based on the following information:

- British Geological Survey (BGS);
- Flood Map for Planning and the Long-Term Flood Risk Map from the Environment Agency and .gov.uk websites;
- Topographical Survey
- Leicestershire and Leicester City Level 1 Strategic Flood Risk Assessment (October 2017)
- Strategic Flood Risk Assessment for Hinckley and Bosworth Borough Council (July 2019)
- Hinckley and Bosworth Borough Council Level 2 Strategic Flood Risk Assessment (2020)
- Environment Agency and HR Wallingford: Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose (May 2008)

### **Disclaimer**

1.8 MEC has completed this report for the benefit of the individuals referred to in paragraph 1.1 and any relevant statutory authority which may require reference in relation to approvals for the proposed development. Other third parties should not use or rely upon the contents of this report unless explicit written approval has been gained from MEC.

1.9 MEC accepts no responsibility or liability for:

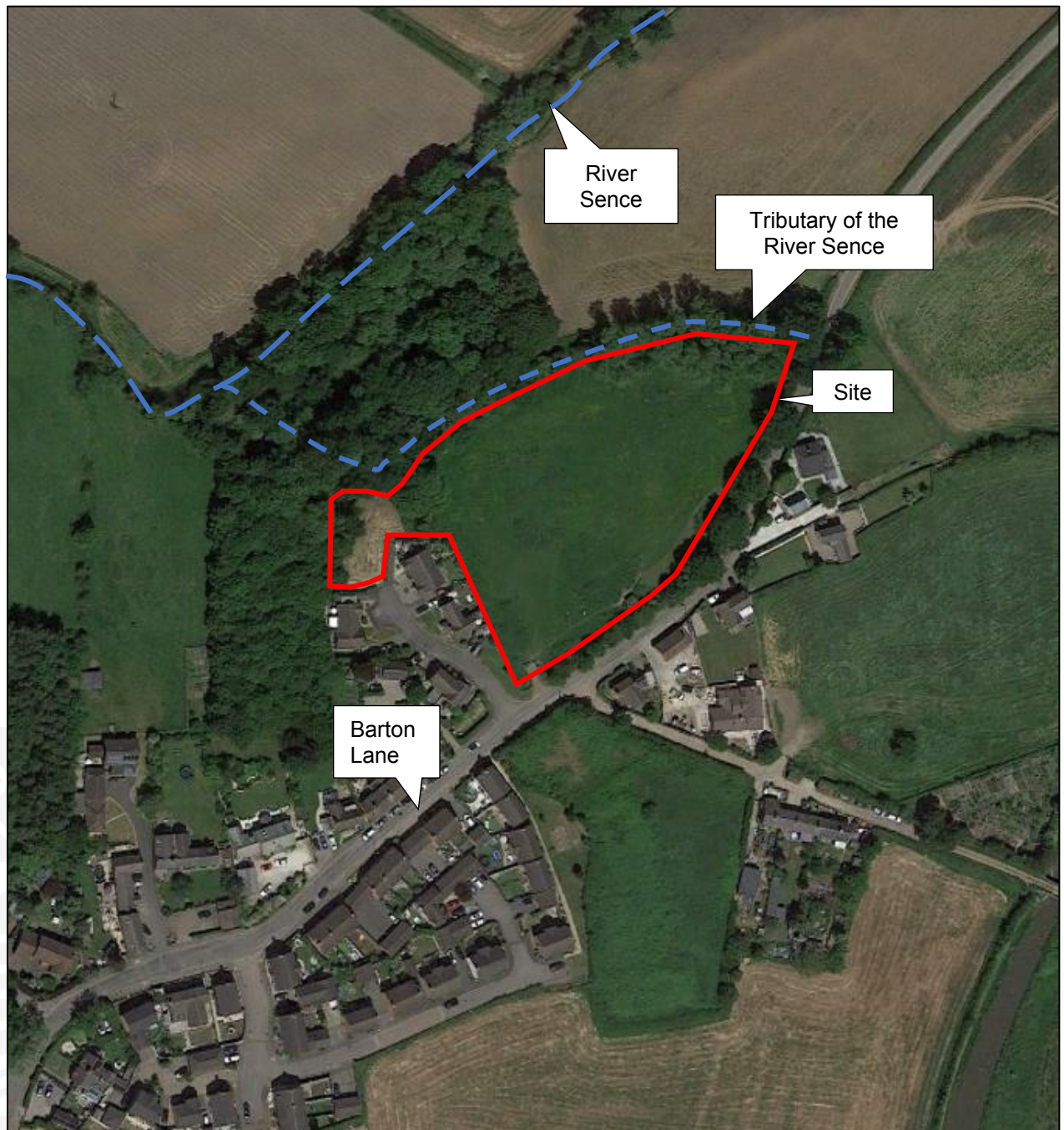
- The consequence of this documentation being used for any purpose or project other than that for which it was commissioned;
- The issue of this document to any third party with whom approval for use has not been agreed.

## 2.0 SITE DESCRIPTION

### Site Location and Features

- 2.1 The Ordnance Survey National Grid Reference (NGR) for the centre of the site is E:437018, N:305645. The site currently consists of greenfield land and is bordered to the north and east by agricultural fields and the Tributary of the River Sence that outfalls into the River Sence, to the south by Barton Lane, and to the west by Chapel Lane and associated dwellings. The site location is shown in Figure 2.1.

**Figure 2.1: Site Location Plan**



### Topographic Data

- 2.2 Full details of the topographical survey are included in **Appendix D**. The information indicates the site slopes gently from south to north with levels ranging from 90.87m AOD to approximately 87.35m AOD.

### Flood Zone Maps & Flood Defence Data

- 2.3 Information relating to the current flood risk to the application site has been obtained from the Environment Agency and .gov.uk websites. The site is not protected by any formal flood defences.

### Watercourses & Hydrology

- 2.4 The closest designated Main River is the River Sence, located 75m north of the site.
- 2.5 An unnamed ditch flowing into the River Sence runs along the northern boundary of the site.

### Historic Flooding

- 2.6 Information published from the Environment Agency Historic Flood Map, the Leicestershire County Council SFRA (2017) and the Hinckley and Bosworth SFRA (2019) indicates there is no evidence of flooding occurring within the vicinity of the site.

### Geological Data

- 2.7 The 1:50,000 British Geological Survey (BGS) viewer shows the whole of the site is underlain by the Gunthorpe Member consisting of mudstone, siltstone and dolomitic. Superficial river terrace deposits overlie the bedrock consisting of sand and gravel.

### Sewer Records

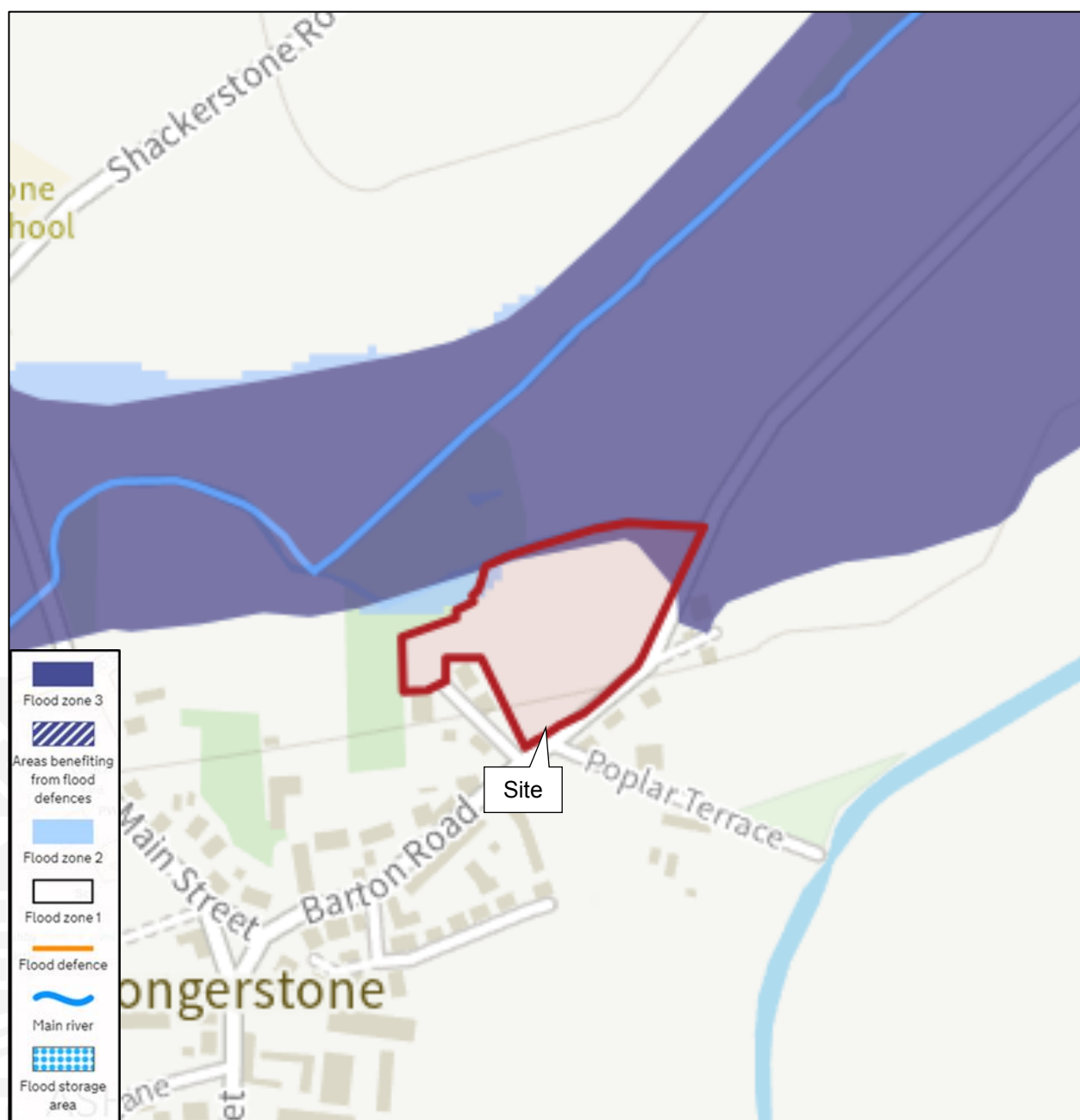
- 2.8 Sewer records were obtained from Severn Trent Water (**Appendix E**). The records illustrate a 150mm Combined Sewer flows north east to south west along Barton Lane near the south boundary of the site. This Combined Sewer has multiple connections from other Combined Sewers joining its flow route. Along Chapel Lane there is both a 150mm Public Foul Sewer and 225mm Public Surface Water Sewer flowing north west to south east, this is in close proximity to the western boundary of the site. The Foul Water Sewer connects into the 150mm Combined Sewer on Barton Lane.

### 3.0 FLOOD RISK TO SITE

#### Flood Zone Allocation

- 3.1 The Flood Map for Planning is shown in Figure 3.1. According to the Hinckley and Bosworth Borough Council Level 2 SFRA (2020) 91% of the site is located within Flood Zone 1. Flood Zone 1 (FZ1) is defined as land assessed as having an annual probability of river flooding less than 0.1%. 9% of the site is located within Flood Zone 2 and Flood Zone 3. Flood Zone 2 (FZ2) is defined as land assessed as having an annual probability of river flooding between 0.1% - 1%. Flood Zone 3 (FZ3) is defined as land assessed as having an annual probability of river flooding greater than 1% if there are no flood defences.

**Figure 3.1: Environment Agency's Flood Map for Planning (Rivers and Seas)**



### Surface Water Flooding Risk

- 3.2 The Environment Agency Flood Risk from Surface Water Map, refer to Figure 3.2, indicates that the site is generally at very low risk of surface water flooding. There is an area at low to high flood risk towards the northwest of the site due to the location of the River Sence. Barton Lane is at low to high risk of surface water flooding.

**Figure 3.2: Environment Agency's Flood Risk from Surface Water Map**



## **Artificial Waterbodies Flood Risk**

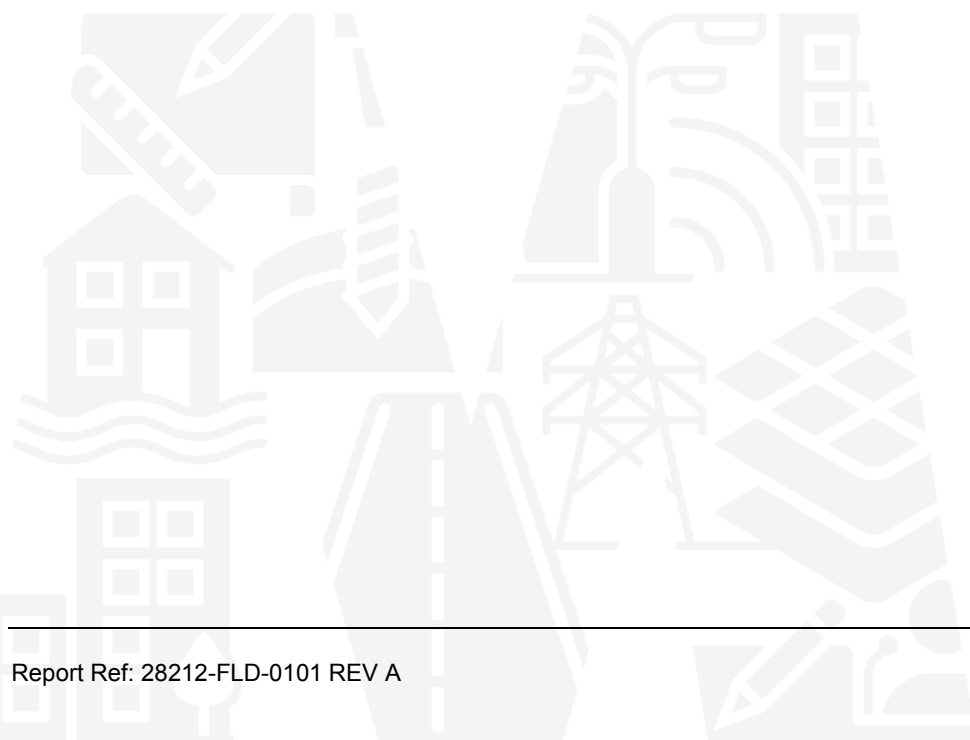
- 3.3 Ashby de la Zouch Canal is located 205m southeast of the site. Canals do not generally pose a direct flood risk as they are regulated water bodies. However, there is a residual risk from lower probability events such as overtopping or embankment failure.
- 3.4 According to the Hinckley and Bosworth SFRA (2019), there have been five recorded incidents of canal breaches from 1981 to 1990, and three recorded incidents of canal overtopping from 2012 to 2016. The canal breaches have occurred in primarily rural locations on the stretch of the canal between Congerstone and Shenton. The canal overtopping incidents occurred in Stoke Golding and Hinckley. However, all of the canal breaches have occurred to the south of the development.
- 3.5 The Environment Agency Reservoir Map indicates the site is not at risk of reservoir flooding. Therefore, the risk of flooding from artificial waterbodies is low.

## **Groundwater Flood Risk**

- 3.6 The Areas Susceptible to Groundwater Flooding Map and the Level 2 SFRA show that areas around the River Sence, including Congerstone, have a medium risk of groundwater flooding.
- 3.7 The site is not located within a Groundwater Source Protection Zone.

## **Sewer Flood Risk**

- 3.8 The Leicestershire and Leicester City SFRA (2017) states that the Severn Trent Water DG5 register has identified three recorded incidents within the CV13 6 postcode within Hinckley and Bosworth Borough. However, this represents a 'snap-shot' in time and is not necessarily a reflection of the current or future flood risk from sewers, as maintenance work may have been undertaken by STW for areas with reoccurring issues. Therefore, the flood risk from public sewers can be considered low.



## 4.0 FLOOD RISK ASSESSMENT

### Flood Risk Assessment Methodology & Objectives

4.1 It is recognised that developments that are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. Current guidance on development and flood risk identifies several key aims for development to ensure that it is sustainable in flood risk terms.

4.2 These aims are as follows:

- The development should not be at significant risk of flooding and should not be susceptible to damage due to flooding;
- The development should not be exposed to flood risk such that the health, safety and welfare of the users of the development, or the population elsewhere, are threatened;
- Safe access to and from the development should be possible during flood events;
- The development should not increase flood risk elsewhere;
- The development should not prevent safe maintenance of watercourses or maintenance and operation of flood defences;
- The development should not be associated with an onerous or difficult operation and maintenance regime to manage flood risk. The responsibility for any operation and maintenance required should be clearly defined;
- Future users of the development should be made aware of any flood risk issues relating to the development;
- The development should not lead to the degradation of the environment; and
- The development should meet all of the above criteria for its lifetime, including considering the potential effects of climate change.

4.3 This Flood Risk Assessment is undertaken with due consideration of these sustainability aims and has been prepared to inform the proposed scheme.

### Project Scope

4.4 In order to achieve the aims outlined above, this Flood Risk Assessment has been undertaken in accordance with current best-practice guidance, including the National Planning Practice Guidance. A scoping study was initially undertaken to identify all potential sources of flooding at the site, which may warrant further consideration. Any potential flooding issues identified in the scoping study have subsequently been considered within this FRA. The scoping study aims to review all available information and provide a qualitative assessment of the flood risk to the site and the impact of the site on flood risk elsewhere. The report has been undertaken with due regard to the EA's National Standing Advice on Development and Flood Risk.

### Scoping Study

4.5 All potential sources of flooding must be considered for any proposed development.

- 4.6 Using the EA Flood Zone mapping, topographical survey and Ordnance Survey maps, a summary of the potential sources of flooding and a review of the potential risk posed by each source on the development area of the application site is presented in Table 4.1.

**Table 4.1: Potential Risks posed by Flooding Sources**

| Source                  | Risk |        |     |          |
|-------------------------|------|--------|-----|----------|
|                         | High | Medium | Low | Very low |
| Fluvial                 |      |        | ✓   |          |
| Tidal                   |      |        |     | ✓        |
| Surface Water           |      |        | ✓   |          |
| Groundwater             |      | ✓      |     |          |
| Sewer                   |      |        | ✓   |          |
| Artificial water bodies |      |        | ✓   |          |

## Flood Risk Mitigation

- 4.7 It is vital that the correct mitigation is put in place to minimise the flood risk to the development. In accordance with the National Planning Policy Framework (NPPF), this includes preventing harm from occurring to the users of the site as well as ensuring the development itself is protected. The below outlines building mitigation measures that are recommended for all sources of flooding.

### Fluvial Flood Risk Mitigation

- 4.8 91% of the proposed development is located within Flood Zone 1. The remaining 9% of the site is located within Flood Zone 2 and 3.
- 4.9 Product 4 information has been requested from the Environment Agency; however, the Environment Agency had no modelled information, see **Appendix F**. As an alternative to Product 4 information, the Flood Map for Planning extents have been plotted against the topographical survey, see **Appendix G**. Using the 0.1% AEP flood extent, an assessment of the proposed 1% AEPCC flood level was made for the site. Flooding for the 0.1% AEP would likely reach levels of up to 88.0m AOD on site and as such, it is estimated that the flood level for the 1% AEPCC will reach up to 88.0m AOD.
- 4.10 It is recommended that no development should occur within Flood Zone 2 and 3. In accordance with the NPPF and Leicestershire County Council guidance, finished floor levels for the development should be set to a minimum of 88.30m AOD (300mm above the 1% AEPCC event) with flood resilience measures set 300mm above the finished floor levels, i.e., 88.60m AOD.

### Flood Resilience and Resistance

- 4.11 In order to ensure the development proposals are in accordance with the NPPF and Leicestershire County Council, flood resilience techniques are recommended to prevent water ingress into the building. Flood resilience measures will be provided as additional mitigation in the event of a flood defence breach or rapid inundation scenario, this will include measures for a water inclusion strategy or water entry strategy as required.
- 4.12 Flood resilience works are measures to make the fabric and services of the building more robust and easier to clean, dry out, and reinstate and enable the building to be reoccupied quickly in the event of floodwater entering the building. Options include: -
- Property level protection including passive flood defences such as flood doors.
  - Raising equipment in the building and any stored goods or equipment 300mm above finished floor levels, i.e. 88.60m AOD.
  - Raising gas and electric intakes and piping/cabling, and electric sockets and cabling, above the likely level of any flood.
  - Installing backflow valves on sanitary drains to prevent sewage from surging up through W. C's, sinks, baths and showers in the event of a flood.
  - Using flood-resilient materials such as concrete and cement-based materials
- 4.13 Further guidance on flood resilient techniques can be found in Improving the Flood Performance of New Buildings (Ref. 20).

### Flood Warnings and Evacuation Plan

- 4.14 The area in the north of the site adjacent to the drainage channel sites within the River Anker and River Sence Flood Alert Area. It is recommended that properties within that section sign up for flood alerts with the Environment Agency. This can be done online at Sign up for flood warnings - GOV.UK ([www.gov.uk](http://www.gov.uk)) or through the Flood Line telephone service on 0345 988 1188. Flood alerts are issued when flooding is possible and the action should be prepared for.
- 4.15 For all fluvial events, access and egress is available via Barton Lane, if approaching from the south.

### Surface Water Flood Risk Mitigation

- 4.16 The Environment Agency Flood Risk from Surface Water Map indicates that the site is generally at very low risk of surface water flooding. There is an area at low to high flood risk towards the northern boundary of the site due to the Tributary of the River Sence flowing into the River Sence. Flooding on site would reach depths of up to 900mm with a velocity of up to 1m/s. The maximum hazard rating is 'danger to some'.
- 4.17 It is recommended that the proposed development is located out of areas at high risk of surface water flooding. Post-development the site levels should be re-profiled to remove any surface water ponding caused by localised low points. Given the above, surface water is likely to be collected by the proposed site-wide drainage infrastructure and conveyed to the proposed discharge point on-site at a QBAR greenfield rate. Therefore, the risk of flooding will be managed at the development and the remaining risk will be very low.

Access and Egress from the site

- 4.18 Safe access and egress should also be considered when appraising the residual risk posed by all sources of flooding. The proposed development will have one access road in and out of the site, which is unaffected by fluvial or surface water flooding. However, Barton Lane is affected by surface water flooding from the 0.1%, 1% and 3.3%AEP flood events.
- 4.19 Detailed surface water modelling information was downloaded from the DEFRA Risk of Flooding from Surface Water Data services.
- 4.20 During the 3.3%AEP event, Barton Lane would only be affected to the north of the development, with depths of up to 1.2m deep and a velocity of 1m/s. The maximum hazard rating is 'danger for most', due to the deep fast flowing water. Access to the site from the south would be viable during the 3.3%AEP event. For the 1%AEP and 0.1%AEP the maximum hazard rating to the north of Barton Road is 'danger for most', so would be inaccessible during flood events.
- 4.21 During the 1%AEP event detailed modelling shows there is a very low risk of flooding to Barton Lane. Surface water flooding along Barton Lane reaches depths of up to 0.30m, with a velocity of up to 0.25m/s to the south of the site. The maximum hazard rating is 'very low'. Access to the site from the south would be viable during the 1%AEP storm event.
- 4.22 During the 0.1%AEP event detailed modelling shows there is a low risk of surface water flooding within Barton Lane, with depths of up to 0.60m deep and a velocity of up to 0.5m/s. The maximum hazard rating is 'danger for some'.
- 4.23 It is recommended that access and egress is taken from the south during flood events, as the hazard rating is lower. According to the R&D Outputs: Flood Risk to People Phase 2 (March 2006) report by the Environment Agency and HR Wallingford, emergency vehicles can travel in flood waters up to 1m deep, and fire engines remain controllable in depths of 0.5m. Therefore, in an emergency, the local emergency services would be able to reach the proposed development, from the south of the development. Land to the north may become impassible during high surface water flooding events.

Flood Risk Mitigation for all other sources of flooding

- 4.24 Ashby de la Zouch Canal is located 205m southeast of the site. Canals do not generally pose a direct flood risk as they are a regulated waterbody, which usually plays a pivotal role in reducing flood risk. However, there is a residual risk from lower probability events such as overtopping or embankment failure.
- 4.25 There is a medium risk of groundwater flooding within the development site. Groundwater monitoring should be undertaken prior to development and if groundwater is discovered, attenuation features should be lined to prevent groundwater seepage. Suspended ground floor slabs may be required to create a void beneath the floor, which will flood before the water rises to enter the proposed dwellings.

## Vulnerability Classification of Proposed Development

- 4.26 The National Planning Practice Guidance: Flood Zone and Flood Risk Tables provide information on the vulnerability classification of various developments. The proposed residential development end use of this site falls in the “more vulnerable” classification. A comparison of the ‘more vulnerable’ use with the development proposals within Flood Zone 1 shows the development proposals are acceptable, subject to an exception test, as shown in Table 4.2.

**Table 4.2: Flood risk vulnerability and flood zone ‘compatibility’ from Flood Risk and Coastal Change - Planning Practice Guidance**

| Flood Risk Vulnerability classification |                                         | Essential Infrastructure | Water compatible | Highly Vulnerable       | More Vulnerable         | Less Vulnerable |
|-----------------------------------------|-----------------------------------------|--------------------------|------------------|-------------------------|-------------------------|-----------------|
| Flood Zone                              | Zone 1 (<0.1%)                          | ✓                        | ✓                | ✓                       | ✓                       | ✓               |
|                                         | Zone 2 (0.1% < p < 1%)                  | ✓                        | ✓                | Exception Test Required | ✓                       | ✓               |
|                                         | Zone 3a (1% < p < 5%)                   | Exception Test required  | ✓                | x                       | Exception Test Required | ✓               |
|                                         | Zone 3b ‘Functional Floodplain’ p > 5%) | Exception Test Required  | ✓                | x                       | x                       | x               |

## Sequential Test

- 4.27 According to National Planning Practice Guidance: Flood Zone and Flood Risk, the Sequential Test gives preference for locating new development in low-risk areas from all sources of flooding. However, if there is no allocated land within low-risk areas that meets the policy aims of the published Local Authority Local Plan or Local Development Framework then other sites in higher flood risk categories can be considered for that development.
- 4.28 Although a small section of the development is located within Flood Zones 2 and 3 and at low to high risk of surface water flooding, the majority of the site sits within Flood Zone 1, with a low surface water flood risk. There is a potential medium groundwater susceptibility due to the proximity to the River Sence, but further testing is required. Therefore, with the mitigation measures set out in sections 4.7 to 4.25 the sequential test can be considered passed on a technical level with all development contained to the area at the lowest risk.

## Exception Test

- 4.29 The proposed development is in accordance with the NPPF and therefore, the exception test is not required.

## 5.0 SURFACE WATER MANAGEMENT STRATEGY

5.1 It is essential that the proposed development does not increase flood risk to adjacent land or downstream of the site, as well as protecting the development from flooding itself. To ensure that the flood risk is minimised, the drainage design will incorporate the following flood mitigation measures:

- Site levels will be designed 300mm above the adjacent road levels to direct all overland surface water flows away from the dwellings, by following the natural topography and any proposed green corridors.
- The proposed development will include a surface water drainage system that will intercept runoff generated within the development. This will minimise the risk of flooding to the new buildings and also reduce the incidence of overland flows.
- The surface water drainage system will convey flows to the attenuation basin on site. The surface water flows generated within the development up to and including a 1% AEP40CC plus urban creep will be stored on-site and discharged at a greenfield controlled rate of 5.0l/s.

### Surface Water Outfall

5.2 Surface water arising from developed sites should, as far as practical, be managed in a sustainable manner to mimic the surface water flows arising from the undeveloped site. When considering the surface water discharge the SuDS hierarchy needs to be adhered to. The SuDS hierarchy states that the options below must be adhered to in order of sustainability or evidenced otherwise before moving down to a less sustainable discharge method;

- Discharge at source (soakaway)
- Watercourse or waterbody
- Public Sewer

#### Discharge at Source

5.3 Information published by the British Geological Survey (BGS) indicates the site is directly underlain by Gunthorpe Member consisting of mudstone, siltstone and dolomitic. Superficial river terrace deposits overlie the bedrock consisting of sand and gravel. Given soakage would not be a viable discharge via an alternative solution needs to be found.

#### Discharge to Watercourse

5.4 The closest designated Main River, is the River Sence, located 75m north of the site. There is a small tributary running alongside the northern boundary of the site. Given that this tributary flows into the River Sence and would not require crossing any third-party lands surface water would outfall into the tributary which in turn will flow into the River Sence.

### Land Use

5.5 In order to calculate the drainage requirements an understanding of the land use on-site needs to be known. Table 5.1, below summarises the proposed land uses within the site. The site currently consists of agricultural land. The current land use has been calculated using the existing site plan and the post-development land use has been measured from the proposed layout.

**Table 5.1: Land Use Summary**

| Land Use Type                     | Existing Site Areas |            | Proposed Site Areas |            |
|-----------------------------------|---------------------|------------|---------------------|------------|
|                                   | Ha                  | %          | Ha                  | %          |
| Impermeable Areas                 | 0.000               | 0          | 0.398               | 43         |
| Green Landscape / Permeable areas | 1.182               | 100        | 0.429               | 57         |
| <b>TOTAL</b>                      | <b>1.182</b>        | <b>100</b> | <b>0.827</b>        | <b>100</b> |

**Climate Change Allowances**

- 5.6 The influence of climate change on rivers and watercourses is likely to increase the frequency of flood events and the overall volume of water that passes the site. When considering surface water runoff from the site, the increase in peak rainfall intensity varies over the lifetime of the development. Where residential developments with a lifetime beyond the 2070s are proposed the Flood Risk Assessments: Climate Change Allowances Guidance requires the use of the Upper-End Allowance for the 2070s epoch (2061 to 2125), the upper end gives an expected increase of 40%, refer to Table 5.2.

**Table 5.2: Peak Rainfall intensity allowance in small and urban catchments from the Flood Risk Assessments: Climate Change Allowances Guidance**

|                               | Total potential change anticipated for the '2050s' (2022 to 2060) |           | Total potential change anticipated for the '2070s' (2061 to 2125) |           |
|-------------------------------|-------------------------------------------------------------------|-----------|-------------------------------------------------------------------|-----------|
|                               | Central                                                           | Upper End | Central                                                           | Upper End |
| Annual Exceedance Probability |                                                                   |           |                                                                   |           |
| 3.3 % AEP                     | 20%                                                               | 35%       | 25%                                                               | 35%       |
| 1 % AEP                       | 20%                                                               | 40%       | 25%                                                               | 40%       |

**Urban Creep Allowances**

- 5.7 Urban creep is the conversion of permeable surfaces to impermeable ones over time, e.g., extensions to existing buildings. It has been shown that, over the lifetime of development, urban creep can increase impermeable areas by as much as 10%. An allowance of 10% for increases in the impermeable area due to urban creep over the lifetime of the development will be included within the drainage calculations. The impermeable area is therefore adjusted to 0.438ha.

**Contributing Drainage Area**

- 5.8 When designing the proposed drainage strategy for a site, the incoming volume of water to the drainage system needs to be quantified. The contributing drainage area considers both the impermeable and permeable areas generated by the development. Permeable areas will likely enter the drainage system during higher return events as the ground will already be saturated.

- 5.9 With a total developable area of 0.827ha, and a total impermeable area (without urban creep) of 0.398ha, the total permeable area for the site is 0.429ha. The amount of direct surface water runoff generated within permeable areas has been estimated by applying the SPR coefficient for the respective area. As such, a SPRHOST of 38.15% leads to an effective permeable area of 0.164ha.
- 5.10 In total, the contributing drainage area for the proposed site is 0.601ha, which comprises of 0.438ha for the total impermeable area (with urban creep) and 0.164ha for the effective permeable area.

### **Discharge Rate**

- 5.11 The controlled rate of discharge for surface water flows within the site has been made 5.0l/s in accordance with Leicestershire County Council Guidelines. This rate is set to stop any blockages occurring which can occur with slower flow rates. With a developable area of 0.827ha surface water flows can discharge into the existing ditch network at a controlled rate of 5l/s.

### **Drainage Strategy**

- 5.12 The overall drainage strategy has been based on the land use table, discharge rates and the current site layout presented in **Appendix B**. In accordance with the National SuDS Standards, the strategy involves conveying surface water flows to an attenuation basin on-site, which will discharge into the existing unnamed watercourse located to the north of the site via gravity at 5l/s.
- 5.13 Surface water flows for a contributing area of 0.601ha will be conveyed to the proposed attenuation basin on-site. A storage volume of 375.21m<sup>3</sup> is required within the proposed attenuation features to allow sufficient water to discharge at 5l/s into the existing unnamed watercourse north of the site and cater for all events up to and including the 1%AEP40CC plus urban creep.
- 5.14 Due to the space available on site the attenuation basin has been designed using GeoGrow's Rootlok Vegetated Wall System. Rootlok Vegetated Wall System is a fully tested, soft engineered system providing flexible solutions that offer the same benefits of a hard engineered system. However, unlike hard revetment alternatives, the system offers many benefits some of which are outline below:
- A green solution with high performance levels
  - Water moves and filters through the system rather than being redirected
  - The system vegetates – roots grow within the structure to provide further structural support
  - A long term and permanent solution – the vegetation protects the structure from UV degradation and the effects of harsh weather
  - Enhances the natural environment – creates natural habitats providing real biodiversity gains
  - Helps to reduce carbon footprint
  - Has a 120-year design life
- 5.15 Using the GeoGrow's Rootlok will provide a better alternative to a gabion system and will allow enough space for long term maintenance and access to the proposed basin.

- 5.16 Additional drainage features such as permeable paving and rainwater harvesting will be used across the site and will provide extra storage on site. Permeable paving will act as a first treatment stage for any run-off and will ensure adequate surface water treatment is provided.
- 5.17 Drainage calculations for the proposed design can be seen in **Appendix H**, and a detailed drainage strategy based on the principles above is shown on drawing 28212\_01\_230\_02 in **Appendix I**.

## Applicable SuDS Techniques

- 5.18 The National Standards for Sustainable drainage systems (Ref. 16) that deals with SuDS cover a whole range of sustainable approaches to surface water drainage management including:
- source control measures including rainwater recycling and drainage;
  - 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.
- 5.19 Each of the five SuDS considerations listed above is discussed below in Table 5.4, with reference to their suitability for the proposed development.

**Table 5.4: Suitability of SuDS techniques**

|                      | COMPONENT                                | SUITABILITY | REASON                                                                                                                                              |
|----------------------|------------------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| Source Control       | Rainwater Harvesting                     | Yes         | Water butts could be used to store run-off from roofs before discharge into the drainage system. Any storage is not to be included in calculations. |
|                      | Green Roofs                              | No          | This would not be appropriate given the scope and scale of the development.                                                                         |
|                      | Bio-retention Systems/ Rain Gardens      | No          | This would not be appropriate given the scope and scale of the development.                                                                         |
| Proprietary Systems  | Proprietary bio-retention systems        | No          | More appropriate SuDS features can be accommodated within the development and are preferred.                                                        |
| Infiltration Devices | Permeable Paving                         | Yes         | Permeable paving could be used within private roads and parking areas.                                                                              |
|                      | Infiltration trenches/ Soakaways         | No          | Unsuitable for infiltration due to ground conditions.                                                                                               |
| Filtration           | Open Swales, Filter Strips/ Drains       | No          | This would not be suitable given the scope and scale of the development.                                                                            |
| Retention/ Detention | Detention Basin, Attenuation Pond/ Tanks | Yes         | The proposed attenuation basin will provide surface water storage before discharging from the site.                                                 |

### Surface Water Quality

- 5.20 The SuDS Manual CIRIA document C753 (Ref. 10), indicates the minimum treatment indices appropriate for contributing pollution hazards for different land use classifications. To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant) that equals or exceeds the pollution hazard index (see Table 5.5).
- 5.21 Surface water runoff from residential roofs will have a very low pollution hazard level, while the residential parking areas will have a low pollution hazard level. All other roads will have a medium pollution hazard level. The exact pollution hazard levels are shown in Table 5.5.

**Table 5.5: Pollution Hazard Indices (Extract from CIRIA 753 Table 26.2)**

| Land use                                                                | Pollution hazard level | Total suspended solids (TSS) | Metals | Hydro-carbons |
|-------------------------------------------------------------------------|------------------------|------------------------------|--------|---------------|
| Residential Roofs                                                       | Very Low               | 0.2                          | 0.2    | 0.05          |
| Individual property driveways, residential car parks, low-traffic roads | Low                    | 0.5                          | 0.4    | 0.4           |

- 5.22 To provide the correct level of treatment, an assessment needs to be made of the mitigation provided by each SuDS feature. This is shown in Table 5.6 below;

**Table 5.6: SuDS Mitigation Indices (Extract from CIRIA 753 Table 26.3)**

| Type of SuDS component | Mitigation indices     |        |              |
|------------------------|------------------------|--------|--------------|
|                        | Total Suspended Solids | Metals | Hydrocarbons |
| Attenuation Basin      | 0.5                    | 0.5    | 0.6          |
| Permeable Paving       | 0.7                    | 0.6    | 0.7          |

- 5.23 For the very low and low pollution hazard levels generated at the site, the proposed attenuation basin and permeable paving would provide sufficient treatment in accordance with the Simple Index Method.

### Exceedance and Flow Routing

- 5.24 The risk of overland flooding from adjacent land to dwellings is very low. The design of levels and features on the site will follow best practice by ensuring any overland flow on the site is routed safely away from dwellings and to areas of lowest risk on site. Any surcharging and subsequent flooding of sewers on or in the vicinity of the site will also be mitigated by the flood routing described above.

### Maintenance and Management

- 5.25 An integrated approach to the maintenance and management of SuDS systems is a requirement of the NPPF and by the Flood & Water Management Act 2010. The aim of a maintenance and management plan is to ensure that there is a clear understanding of drainage responsibilities and that a maintenance regime is implemented for all new drainage systems for the lifetime of the development, so they can continue to function as required.
- 5.26 The surface water drainage network is to be offered for adoption. The attenuation basin has not been designed to an adoptable standard and therefore should remain within private ownership. However, this assumption can be visited at the detailed design stage, where an agreement can be sought with the sewerage undertaker to offer this component for adoption.
- 5.27 All private drainage systems, including the SuDS features, will be maintained by individual homeowners, landowners or an appointed management company.
- 5.28 A proposed maintenance schedule which breaks down the maintenance requirements of the various proposed assets is shown in **Appendix J**. At this moment in time, a maintenance company has not been linked to the proposed development. A more detailed maintenance schedule will be provided once details of the exact maintenance company has been confirmed.

## 6.0 FOUL WATER STRATEGY

6.1 According to The Building Regulations (2010), foul water drainage from new developments should be discharged into the following in order of priority:

- A public sewer, or;
- A private sewer communicating with a public sewer, or;
- A septic tank which has an appropriate form of secondary treatment, or;
- A cesspool.

6.2 Sewer records were obtained from Severn Trent Water see **Appendix E**. The records also show a 150mm Combined Gravity Pipe flowing from northeast to southwest along Barton Lane.

6.3 The disposal of foul water from the site will be via a new proposed connection into the 150mm foul water sewer at MH0602. Given the levels on site, foul water will discharge via gravity, subject to a formal S106 agreement. The peak foul flow rate arising as a result of the development was estimated as, approximately, 1l/s – assuming a foul load rate of 0.05 l/s/dwelling.

## 7.0 CONCLUSION AND SUMMARY

7.1 MEC has been commissioned by Naylor's Estate Agents to undertake a Flood Risk Assessment for a proposed residential development at Barton Lane, Congerstone. This assessment has been undertaken to ascertain the constraints of the development to the site and to assess the impact of the design, concerning flood risk.

- 91% of the site is located within Flood Zone 1 with the remaining 9% in Flood Zones 2 and 3.
- The majority of the site is at very low risk from surface water flooding. There is an area at low to high risk towards the northern boundary of the site, due to the tributary flowing into the River Sence.
- The site is at low risk of flooding from the Ashby Canal. Canals do not generally pose a direct flood risk as they are a regulated waterbody, which usually plays a pivotal role in reducing flood risk. However, there is a residual risk from lower probability events such as overtopping or embankment failure.
- The site is at medium risk of groundwater flooding due to its location to the River Sence.
- Product 4 information has been requested from the Environment Agency however, no modelled information has been provided. As an alternative, the Flood Map for Planning Extents has been plotted against the topographical survey. Using the 0.1% AEP flood extent, an assessment of the proposed 1% AEP CC flood level was made for the site. Flooding for the 0.1% AEP would likely reach levels of up to 88.0m on site and as such, it is estimated that the flood level for the 1% AEP CC will reach up to 88.0m.
- Finished floor levels should be set to 88.30m AOD with resilience measures set 300mm above the finished floor level at 88.60m AOD. It is recommended that no development should occur within Flood Zone 2 and 3.
- Groundwater monitoring should be undertaken prior to development and if groundwater is discovered, attenuation features should be lined to prevent groundwater seepage. Suspended ground floor slabs may be required to create a void beneath the floor, which will flood before the water rises to enter the proposed dwellings.
- Safe access and egress are viable along Barton Lane, from the south. The north will remain inaccessible during all surface water storm events.
- In accordance with the drainage hierarchy surface water runoff generated at the site will be conveyed by and stored within an attenuation basin. Surface water stored within the proposed attenuation basin will be directed to the Tributary of the River Sence to the north of the site, at a controlled rate of 5.0l/s in accordance with Leicester County Council Guidelines and to avoid any possibilities of blockages within the sewers.
- A total storage volume of 375.21m<sup>3</sup> will be available within the proposed attenuation basin to manage flows generated for events up to and including the 1% AEP 40CC storm event. Due to the space available on site the attenuation basin has been designed using GeoGrow's Rootlok Vegetated Wall System.
- Permeable paving will be proposed on-site within car parking spaces and private driveways. These features will provide extra storage on-site, act as a first treatment stage for any run-off and will ensure adequate surface water treatment is provided.
- Foul water flows from the site will be discharged via gravity into the existing Combined Water Sewer flowing north east to south west along Barton Lane, south of the site. It will connect via MH0501, subject to agreement with STW. The peak foul rate arising as a result of the development has been estimated at approximately 1.l/s, assuming a foul load rate of 0.05l/s.

7.2 With the above measures in place, the development of the site will not create any flood risk issues for the wider area.



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# APPENDICES



## APPENDIX A

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The Old Chapel  
Station Road  
Hugglescote  
Leicestershire  
LE67 2GB



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## SITE LOCATION PLAN

Project: Barton Lane, Congerstone

File Ref: 28212

O.S. Grid Ref: E:437018, N:305645

Postcode: CV13 6NB





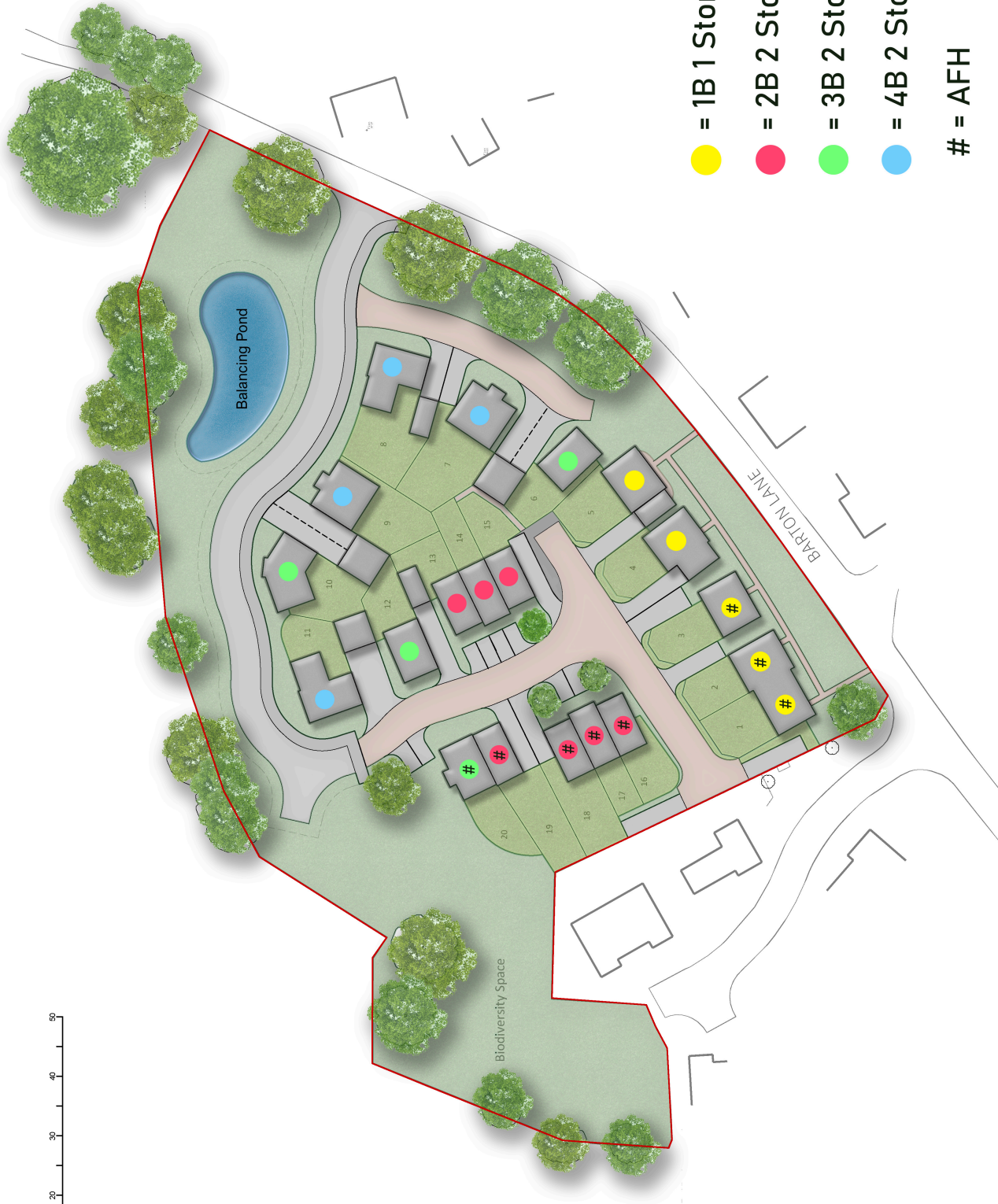
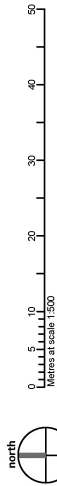
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## APPENDIX B



Drawing No: 22-119- PL02  
Drawing Stage: Planning Application  
Scale: 1:500@A2  
Date: 08.08.23  
Drawn By: JET/MEO

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## APPENDIX C

## Policies and References

### National Planning Policy Framework

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 taken into account 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. 17) which provides additional guidance on flood risk.

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 in which the Environment Agency has notified the local planning authority of having critical drainage problems.

Key elements from the document include

*"Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk..."*

*"Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding."*

*"When determining any planning applications, local planning authorities should ensure flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific risk assessment. Development should only be allowed in areas at risk of flooding where in light of this assessment (and the sequential and exception tests) 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*
- 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 plan routes are included where appropriate, as part of an agreed emergency plan."*

### Flood and Water Management Act 2010

The Flood and Water Management Act 2010 (Ref. 19) gained Royal Assent on the 8th April 2010. The Flood and Water Management Act is the government's newest legislation to help improve flood risk management and ensure the security of water supplies in England and Wales. The Act 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.

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 – March 2014, updated August 2021**

The Government's new planning policy on sustainable drainage systems came into effect on 6 April 2015. It expects local planning policies and decisions on planning applications relating to major development (those of 10 dwellings or more; or equivalent non-residential or mixed development) to ensure 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.

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 the oversight of SuDS from county councils (who are also LLFAs) to local planning authorities. According to the new planning policy, local planning authorities are expected, 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, and
- To ensure through the use of planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

The policy also states that the sustainable drainage system 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 – 2015**

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.

The following documents have been referred to in this report:

- 1 The Building Regulations 2015, Approved Document H.
- 2 Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code") - October 2019, updated June 2022.
- 3 Planning Practice Guidance – November 2016, updated August 2022.
- 4 National Planning Policy Framework - March 2012, updated July 2021
- 5 Civil Engineering Specification for the Water Industry, 7<sup>th</sup> Edition.
- 6 Flood Risk and Coastal Change Guidance – March 2014, updated August 2022.
- 7 Environment Agency Flood Risk Standing Advice.
- 8 Environment Agency 'Flood Risk Assessments – Climate Change Allowances' - February 2016., updated May 2022.
- 9 The SuDS Manual – CIRIA C753.
- 10 Interim Code of Practice for Sustainable Drainage Systems – National SuDS Working Group, July 2004.
- 11 Cranfield University Soilscales Map - <http://www.landis.org.uk/soilscales/>.
- 12 British Geological Survey – Geology of Britain viewer, <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>.
- 13 FEH WebService – Centre for Ecology and Hydrology, <https://fehweb.ceh.ac.uk/GB/map>.
- 14 Design and analysis of urban storm drainage. The Wallingford Procedure Vol.1.
- 15 Institute of Hydrology Report No. 124 – Flood Estimation for small catchments.
- 16 Sustainable Drainage Systems – Non-statutory technical standards for sustainable drainage systems – March 2015.
- 17 Water Industry Act 1991.
- 18 Flood and Water Management Act 2010.



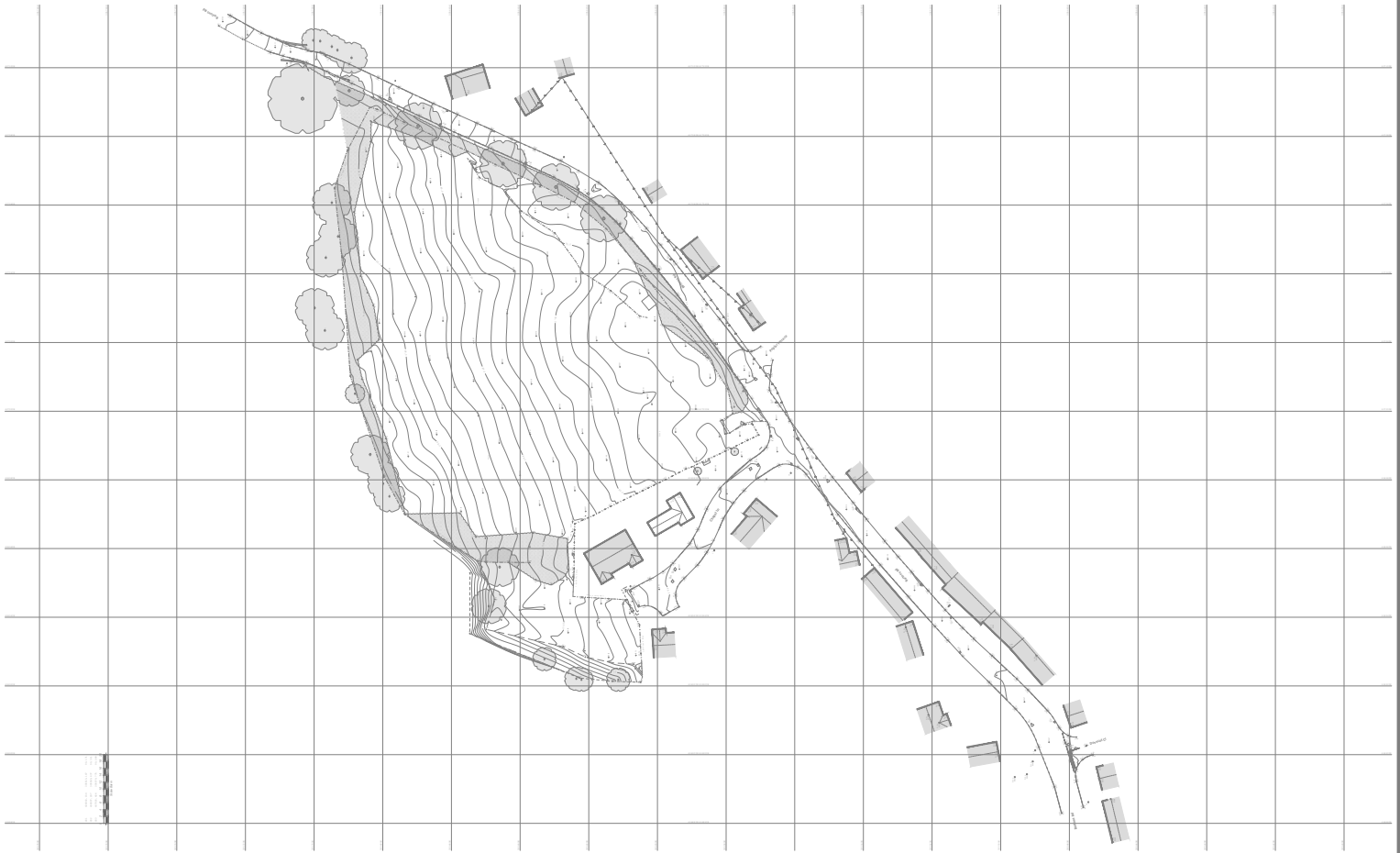
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# APPENDICES



## APPENDIX D





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## APPENDIX E



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- |                                            |                        |                 |
|--------------------------------------------|------------------------|-----------------|
| Public Foul Gravity/Lateral Drain          | Highway Drain          | Manhole Foul    |
| Public Combined Gravity/Lateral Drain      | Overflow Pipe          | Manhole Surface |
| Public Surface Water Gravity/Lateral Drain | Disposal Pipe          | Abandoned Pipe  |
| Pressure Foul                              | Culverted Water Course | Chamber         |
| Pressure Combined                          | Pumping Station        |                 |
| Pressure Surface Water                     | Fitting                |                 |
- Section 104 sewers are shown in green  
Private sewers are shown in magenta

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28212

## **GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS**

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:  
**0800 783 4444 (24 hours)**

- a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991 (a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.
- b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.
- c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.
- d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.
- e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).
- f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.
2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).
3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.

4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.
5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.
6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.
7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.
8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.
9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.
10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.
11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.
12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.
13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,
14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

## **TREE PLANTING RESTRICTIONS**

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.
16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main or other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.





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## APPENDIX F

## Product 4 (Detailed Flood Risk Data) for Barton Lane, Congerstone

Reference number: 319593

Date of issue: 15/08/2023

We are unable to provide you with a full product 4 response because:

- There is no detailed modelled information available for this site because there is no modelling for this area.
- And we do not have any records of flooding in this area.

### **Flood Map for Planning (Rivers and Sea)**

The Flood Map for planning (Rivers and Sea) indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood event with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding (flood zone 3). It also shows the extent of the Extreme Flood Outlines (Flood zone 2) which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater. The flood zones refer to the land at risk of flooding and **does not** refer to individual properties. It is possible for properties to be built at a level above the floodplain but still fall within the risk area.

The Flood Map only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered that flooding may occur from other sources such as surface water sewers, road drainage, etc. This map can be accessed via our website: <https://flood-map-for-planning.service.gov.uk/>

With regards to the history of flooding I can advise that we do not have any records of flooding in this area. It is possible that other flooding may have occurred that we do not have records for, and other organisations, such as the Lead Local Flood Authority or Internal Drainage Boards (where relevant), may have records.

This information is provided subject to the [Open Government Licence](#), which you should read for details of permitted use.

### **Risk of Surface Water Flooding Map**

Managing the risk of flooding from surface water is the responsibility of Lead Local Flood Authorities. The 'risk of flooding from surface water' map has been produced by the Environment Agency on behalf of government, using information and input from Lead Local Flood Authorities.

You may wish to contact your Local Authority who may be able to provide information on surface water.

It is not possible to say for certain what the flood risk is but we use the best information available to provide an indication so that people can make informed choices about living with or managing the risks. The information we supply does not provide an indicator of flood risk at an individual site level. Further information can be found on the Environment Agency's website, <https://flood-warning-information.service.gov.uk/long-term-flood-risk>



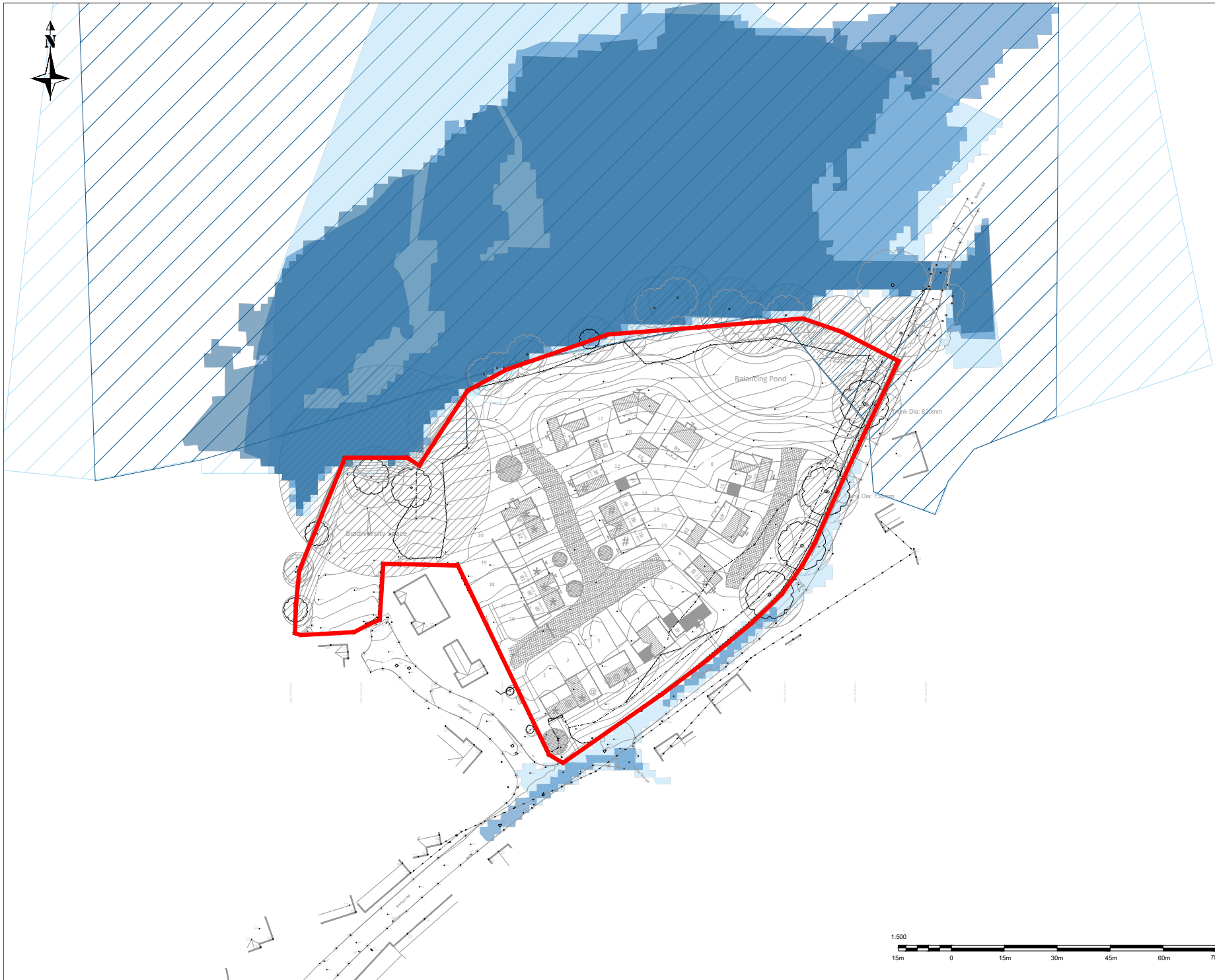
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## APPENDIX G



- NOTES:**
1. DO NOT SCALE THIS DRAWING.
  2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SPECIALIST DESIGN DRAWINGS AND DETAILS.
  3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.
  4. THIS DRAWING IS FOR STRATEGY PURPOSES ONLY AND IS NOT TO BE USED FOR CONSTRUCTION PURPOSES.

- KEY**
- FLOOD ZONE 2 EXTENT = 88.0m AOD
  - FLOOD ZONE 3 EXTENT = 88.0m AOD
  - 3.3% SURFACE WATER FLOOD RISK EXTENT
  - 1% SURFACE WATER FLOOD RISK EXTENT
  - 0.1% SURFACE WATER FLOOD RISK EXTENT
  - SITE BOUNDARY

|                                                 |                             |                                                                                                                                                                                  |     |        |          |
|-------------------------------------------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|--------|----------|
| REV                                             | FIRST ISSUE                 | 20                                                                                                                                                                               | 20  | 15     | 25/08/20 |
| REV                                             | AMENDMENTS                  | DRN                                                                                                                                                                              | CHK | APP    | DATE     |
| PROJECT:                                        | BARTON LANE,<br>CONGERSTONE |                                                                                                                                                                                  |     |        |          |
| DRAWING TITLE:                                  | FLOOD RISK EXTENTS          |                                                                                                                                                                                  |     |        |          |
| CLIENT:                                         | C & N STAMPER               |                                                                                                                                                                                  |     |        |          |
| DRAWING NUMBER:                                 | 28212_01_230_01             |                                                                                                                                                                                  |     |        |          |
| REVISION:                                       | -                           | SHEET SIZE                                                                                                                                                                       | A1  | SCALE: | 1:500    |
| STATUS:                                         | FOR INFORMATION / APPROVAL  |                                                                                                                                                                                  |     |        |          |
| <b>M-EC</b><br>Consulting Development Engineers |                             | Telephone: 01593 264 753<br>Email: gmo@me-ec.co.uk<br>Website: www.me-ec.co.uk<br>ORDNANCE SURVEY © CROWN<br>COPYRIGHT 2015. ALL RIGHTS<br>RESERVED. LICENCE NUMBER<br>100059865 |     |        |          |

File Location: Y:\M-EC\AS\28212\_01\_230\_01\Drawings\01\_Series\_Temporary\28212\_01\_230\_01\_FloodRiskExtents.dwg



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# APPENDICES



## APPENDIX H

|                  |                 |
|------------------|-----------------|
| <b>Doc. Ref.</b> | 28212-CALC-0101 |
| <b>Sheet</b>     | 1 of 7          |
| <b>Engineer</b>  | B. Oyston       |
| <b>Date</b>      | 20 Dec 23       |
| <b>Revision</b>  | -               |

## DESIGN CALCULATIONS FRONT SHEET

|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SCHEME</b>                                                           | Barton Lane, Congerstone, CV13 6NB                                                                                                                                                                                                                                                                                                                                                                     |
| <b>CLIENT</b>                                                           | Naylors Estate Agents                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>ASPECTS OF SCHEME TO BE DESIGNED</b>                                 | Greenfield Calculations<br>Surface water attenuation design and simulation results for the 1%AEP40CC event for the development site.                                                                                                                                                                                                                                                                   |
| <b>CODES OF PRACTICE, DESIGN SPECIFICATIONS &amp; BRITISH STANDARDS</b> | <ul style="list-style-type: none"> <li>• Design and analysis of urban storm drainage. Wallingford Procedure Vol.1</li> <li>• Sustainable Drainage Systems- Non-Statutory technical standards for Sustainable drainage systems- 2015</li> <li>• The SuDS Manual – CIRIA C753</li> </ul>                                                                                                                 |
| <b>NOTES</b>                                                            | <p>Existing runoff conditions have been calculated using the FEH Statistical method within UK SuDS to calculate the Greenfield discharge rate for the developable area of 0.827ha, the QBAR Greenfield rate has been calculated as 2.2l/s but as this could cause blockages, a controlled minimum rate of 5l/s has been applied.</p> <p>Design calculations were carried out within Flow Causeway.</p> |

## INDEX

| Pages | Calculations                                                                                   | Checked by | Date     |
|-------|------------------------------------------------------------------------------------------------|------------|----------|
| 2-7   | QBAR calculations and Geo-Cellular tank source control design details for the 1%AEP45CC event. | ZJ         | 20/12/23 |

### Design Settings

|                                      |        |                                    |               |
|--------------------------------------|--------|------------------------------------|---------------|
| Rainfall Methodology                 | FEH-22 | Minimum Velocity (m/s)             | 1.00          |
| Return Period (years)                | 100    | Connection Type                    | Level Soffits |
| Additional Flow (%)                  | 0      | Minimum Backdrop Height (m)        | 0.200         |
| CV                                   | 0.750  | Preferred Cover Depth (m)          | 1.200         |
| Time of Entry (mins)                 | 5.00   | Include Intermediate Ground        | ✓             |
| Maximum Time of Concentration (mins) | 30.00  | Enforce best practice design rules | ✓             |
| Maximum Rainfall (mm/hr)             | 200.0  |                                    |               |

### Nodes

| Name         | Area<br>(ha) | T of E<br>(mins) | Cover<br>Level<br>(m) | Diameter<br>(mm) | Depth<br>(m) |
|--------------|--------------|------------------|-----------------------|------------------|--------------|
| Basin        | 0.601        | 5.00             | 88.000                | 1200             | 1.300        |
| Flow Control |              |                  | 88.000                | 1200             | 1.400        |
| Outfall      |              |                  | 88.000                | 1200             | 1.500        |

### Links

| Name  | US<br>Node   | DS<br>Node   | Length<br>(m) | ks (mm) /<br>n | US IL<br>(m) | DS IL<br>(m) | Fall<br>(m) | Slope<br>(1:X) | Dia<br>(mm) | T of C<br>(mins) | Rain<br>(mm/hr) |
|-------|--------------|--------------|---------------|----------------|--------------|--------------|-------------|----------------|-------------|------------------|-----------------|
| 1.000 | Basin        | Flow Control | 10.000        | 0.600          | 86.700       | 86.600       | 0.100       | 100.0          | 300         | 5.11             | 162.1           |
| 1.001 | Flow Control | Outfall      | 10.000        | 0.600          | 86.600       | 86.500       | 0.100       | 100.0          | 300         | 5.21             | 160.9           |

| Name  | Vel<br>(m/s) | Cap<br>(l/s) | Flow<br>(l/s) | US<br>Depth<br>(m) | DS<br>Depth<br>(m) | Σ Area<br>(ha) | Σ Add<br>Inflow<br>(l/s) |
|-------|--------------|--------------|---------------|--------------------|--------------------|----------------|--------------------------|
| 1.000 | 1.572        | 111.1        | 264.0         | 1.000              | 1.100              | 0.601          | 0.0                      |
| 1.001 | 1.572        | 111.1        | 262.2         | 1.100              | 1.200              | 0.601          | 0.0                      |

### Pipeline Schedule

| Link  | Length<br>(m) | Slope<br>(1:X) | Dia<br>(mm) | Link<br>Type | US CL<br>(m) | US IL<br>(m) | US Depth<br>(m) | DS CL<br>(m) | DS IL<br>(m) | DS Depth<br>(m) |
|-------|---------------|----------------|-------------|--------------|--------------|--------------|-----------------|--------------|--------------|-----------------|
| 1.000 | 10.000        | 100.0          | 300         | Circular     | 88.000       | 86.700       | 1.000           | 88.000       | 86.600       | 1.100           |
| 1.001 | 10.000        | 100.0          | 300         | Circular     | 88.000       | 86.600       | 1.100           | 88.000       | 86.500       | 1.200           |

| Link  | US<br>Node   | Dia<br>(mm) | Node<br>Type | MH<br>Type | DS<br>Node   | Dia<br>(mm) | Node<br>Type | MH<br>Type |
|-------|--------------|-------------|--------------|------------|--------------|-------------|--------------|------------|
| 1.000 | Basin        | 1200        | Manhole      | Adoptable  | Flow Control | 1200        | Manhole      | Adoptable  |
| 1.001 | Flow Control | 1200        | Manhole      | Adoptable  | Outfall      | 1200        | Manhole      | Adoptable  |

### Manhole Schedule

| Node         | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections                                                                         | Link  | IL<br>(m) | Dia<br>(mm) |
|--------------|-----------|--------------|-------------|-------------------------------------------------------------------------------------|-------|-----------|-------------|
| Basin        | 88.000    | 1.300        | 1200        |  |       |           |             |
|              |           |              |             | 0                                                                                   | 1.000 | 86.700    | 300         |
| Flow Control | 88.000    | 1.400        | 1200        |  | 1     | 1.000     | 86.600      |
|              |           |              |             | 0                                                                                   | 1.001 | 86.600    | 300         |

### Manhole Schedule

| Node    | CL<br>(m) | Depth<br>(m) | Dia<br>(mm) | Connections | Link  | IL<br>(m) | Dia<br>(mm) |
|---------|-----------|--------------|-------------|-------------|-------|-----------|-------------|
| Outfall | 88.000    | 1.500        | 1200        | 1           | 1.001 | 86.500    | 300         |

### Simulation Settings

|                      |        |                                         |      |                                       |     |
|----------------------|--------|-----------------------------------------|------|---------------------------------------|-----|
| Rainfall Methodology | FEH-22 | Drain Down Time (mins)                  | 240  | 100 year (l/s)                        | 5.4 |
| Summer CV            | 0.750  | Additional Storage (m <sup>3</sup> /ha) | 20.0 | Check Discharge Volume                | ✓   |
| Winter CV            | 0.840  | Check Discharge Rate(s)                 | ✓    | 100 year 360 minute (m <sup>3</sup> ) |     |
| Analysis Speed       | Normal | 2 year (l/s)                            | 2.0  |                                       |     |
| Skip Steady State    | x      | 30 year (l/s)                           | 4.3  |                                       |     |

### Storm Durations

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

| Return Period<br>(years) | Climate Change<br>(CC %) | Additional Area<br>(A %) | Additional Flow<br>(Q %) |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 2                        | 0                        | 0                        | 0                        |
| 30                       | 35                       | 0                        | 0                        |
| 100                      | 40                       | 0                        | 0                        |

### Pre-development Discharge Rate

|                              |            |                        |      |
|------------------------------|------------|------------------------|------|
| Site Makeup                  | Greenfield | Growth Factor 30 year  | 1.95 |
| Greenfield Method            | FEH        | Growth Factor 100 year | 2.48 |
| Positively Drained Area (ha) | 0.827      | Betterment (%)         | 0    |
| SAAR (mm)                    | 633        | QMed                   | 2.0  |
| Host                         | 1          | QBar                   | 2.2  |
| BFIHost                      | 0.478      | Q 2 year (l/s)         |      |
| Region                       | 1          | Q 30 year (l/s)        |      |
| QBar/QMed conversion factor  | 1.111      | Q 100 year (l/s)       |      |
| Growth Factor 2 year         | 0.90       |                        |      |

### Pre-development Discharge Volume

|                              |            |                                 |     |
|------------------------------|------------|---------------------------------|-----|
| Site Makeup                  | Greenfield | Return Period (years)           | 100 |
| Greenfield Method            | FSR/FEH    | Climate Change (%)              | 0   |
| Positively Drained Area (ha) | 0.827      | Storm Duration (mins)           | 360 |
| Soil Index                   | 1          | Betterment (%)                  | 0   |
| SPR                          | 0.10       | PR                              |     |
| CWI                          |            | Runoff Volume (m <sup>3</sup> ) |     |

### Node Flow Control Online Hydro-Brake® Control

|                          |        |                         |                                |
|--------------------------|--------|-------------------------|--------------------------------|
| Flap Valve               | x      | Objective               | (HE) Minimise upstream storage |
| Replaces Downstream Link | ✓      | Sump Available          | ✓                              |
| Invert Level (m)         | 86.600 | Product Number          | CTL-SHE-0104-5000-1100-5000    |
| Design Depth (m)         | 1.100  | Min Outlet Diameter (m) | 0.150                          |
| Design Flow (l/s)        | 5.0    | Min Node Diameter (mm)  | 1200                           |

Node Basin Depth/Area Storage Structure

|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 86.700 |
| Side Inf Coefficient (m/hr) | 0.00000 | Porosity      | 1.00 | Time to half empty (mins) |        |

| Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) | Depth<br>(m) | Area<br>(m <sup>2</sup> ) | Inf Area<br>(m <sup>2</sup> ) |
|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|--------------|---------------------------|-------------------------------|
| 0.000        | 265.0                     | 0.0                           | 1.000        | 466.4                     | 0.0                           | 1.300        | 537.8                     | 0.0                           |

**Results for 2 year Critical Storm Duration. Lowest mass balance: 99.92%**

| Node Event        | US<br>Node   | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status     |
|-------------------|--------------|----------------|--------------|--------------|-----------------|------------------|---------------|------------|
| 240 minute winter | Basin        | 184            | 86.926       | 0.226        | 20.4            | 67.2816          | 0.0000        | OK         |
| 240 minute winter | Flow Control | 184            | 86.925       | 0.325        | 12.9            | 0.3681           | 0.0000        | SURCHARGED |
| 15 minute summer  | Outfall      | 1              | 86.500       | 0.000        | 4.9             | 0.0000           | 0.0000        | OK         |

| Link Event<br>(Upstream Depth) | US<br>Node   | Link         | DS<br>Node   | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) | Discharge<br>Vol (m³) |
|--------------------------------|--------------|--------------|--------------|------------------|-------------------|----------|------------------|-----------------------|
| 240 minute winter              | Basin        | 1.000        | Flow Control | 12.9             | 0.482             | 0.117    | 0.6364           |                       |
| 240 minute winter              | Flow Control | Hydro-Brake® | Outfall      | 5.0              |                   |          |                  | 111.7                 |

**Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.92%**

| Node Event        | US<br>Node   | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status     |
|-------------------|--------------|----------------|--------------|--------------|-----------------|------------------|---------------|------------|
| 360 minute winter | Basin        | 352            | 87.462       | 0.762        | 41.8            | 268.2186         | 0.0000        | SURCHARGED |
| 360 minute winter | Flow Control | 352            | 87.462       | 0.862        | 9.0             | 0.9744           | 0.0000        | SURCHARGED |
| 15 minute summer  | Outfall      | 1              | 86.500       | 0.000        | 5.0             | 0.0000           | 0.0000        | OK         |

| Link Event<br>(Upstream Depth) | US<br>Node   | Link         | DS<br>Node   | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) | Discharge<br>Vol (m³) |
|--------------------------------|--------------|--------------|--------------|------------------|-------------------|----------|------------------|-----------------------|
| 360 minute winter              | Basin        | 1.000        | Flow Control | 9.0              | 0.379             | 0.081    | 0.7042           |                       |
| 360 minute winter              | Flow Control | Hydro-Brake® | Outfall      | 5.0              |                   |          |                  | 149.5                 |

**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.92%**

| Node Event        | US<br>Node   | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status     |
|-------------------|--------------|----------------|--------------|--------------|-----------------|------------------|---------------|------------|
| 360 minute winter | Basin        | 352            | 87.698       | 0.998        | 55.1            | 375.2051         | 0.0000        | SURCHARGED |
| 360 minute winter | Flow Control | 352            | 87.698       | 1.098        | 12.9            | 1.2416           | 0.0000        | SURCHARGED |
| 15 minute summer  | Outfall      | 1              | 86.500       | 0.000        | 5.0             | 0.0000           | 0.0000        | OK         |

| Link Event<br>(Upstream Depth) | US<br>Node   | Link         | DS<br>Node   | Outflow<br>(l/s) | Velocity<br>(m/s) | Flow/Cap | Link<br>Vol (m³) | Discharge<br>Vol (m³) |
|--------------------------------|--------------|--------------|--------------|------------------|-------------------|----------|------------------|-----------------------|
| 360 minute winter              | Basin        | 1.000        | Flow Control | 12.9             | 0.382             | 0.116    | 0.7042           |                       |
| 360 minute winter              | Flow Control | Hydro-Brake® | Outfall      | 5.0              |                   |          |                  | 163.1                 |



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## APPENDIX I





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## APPENDIX J

## MAINTENANCE AND MANAGEMENT

A proposed maintenance plan is shown in the table below and breaks down the maintenance requirements of the various proposed assets in accordance with the CIRIA C753 SuDS Manual guidance.

**Table 1.1: Proposed Maintenance Regime**

| Drainage Asset       | Responsible Organisation               | Maintenance Work                                                                                              | Frequency                                                            |
|----------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Pipework / Manholes  | Private Ownership / Management Company | Inspect pipework and clear blockages                                                                          | Annually or after severe storms.                                     |
|                      |                                        | Inspect manholes and clear blockages                                                                          |                                                                      |
|                      |                                        | Repair any defects in the network                                                                             |                                                                      |
|                      |                                        | Inspect flow control, ensure operating freely and pivoting bypass door and penstock valve operating correctly |                                                                      |
| Headwalls            | Private Ownership / Management Company | Inspect the structure and remove any debris/litter on the structure.                                          | Annually or after severe storms                                      |
|                      |                                        | Replace malfunctioning parts or structures                                                                    | As required                                                          |
| Flow Control Chamber | Private Ownership / Management Company | Inspect structure and remove excessive silt build-up                                                          | Monthly during construction and then annually or after severe storms |
|                      |                                        | Inspect pipework and manholes also clear blockages                                                            | Annually or after severe storms                                      |
|                      |                                        | Inspect manholes and clear blockages                                                                          |                                                                      |
|                      |                                        | Inspect flow control, ensure operating freely and pivoting bypass door and penstock valve operating correctly |                                                                      |
|                      |                                        | Replace malfunctioning parts or structures                                                                    |                                                                      |
|                      |                                        | Inspect for evidence of poor operation                                                                        | 6 monthly                                                            |
|                      |                                        | Inspect sediment accumulation rates and establish appropriate removal frequencies                             |                                                                      |
|                      |                                        | Test control structure to ensure operating as per original design                                             | 5 yearly                                                             |
| Trees                | Private Ownership / Management Company | If drain inlet has settled, cracked or moved, investigate and repair as appropriate                           |                                                                      |
|                      |                                        | Remove litter and debris                                                                                      | Monthly or as required                                               |
|                      |                                        | Manage other vegetation and remove nuisance plants                                                            |                                                                      |
|                      |                                        | Inspect inlets and outlets                                                                                    | Monthly                                                              |
|                      |                                        | Check tree health and manage tree appropriately                                                               | Annually or as required                                              |
|                      |                                        | Remove silt build-up from inlets and surface and replace mulch as necessary                                   |                                                                      |
|                      |                                        | Water                                                                                                         |                                                                      |
|                      |                                        | Inspect silt accumulation rates and establish appropriate removal frequencies                                 | Half-yearly                                                          |



|                              |                                        |                                                                                                                                                                                     |                                                                                                                                                          |
|------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Permeable Pavements          | Private Ownership / Management Company | Brushing and vacuuming (standard cosmetic sweep over the whole surface)                                                                                                             | Once a year after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging of manufacturer's recommendations. |
|                              |                                        | Stabilise and mow contributing and adjacent areas                                                                                                                                   | As required                                                                                                                                              |
|                              |                                        | Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than sweeping                                                               |                                                                                                                                                          |
|                              |                                        | Remediate any landscaping which, through vegetation maintenance of soil slip, has been raised to within 50 mm of the level of the paving                                            |                                                                                                                                                          |
|                              |                                        | Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users and replace lost jointing material |                                                                                                                                                          |
|                              |                                        | Rehabilitation of surface and upper substructure by remedial sweeping                                                                                                               | Every 10 to 15 years or as required                                                                                                                      |
|                              |                                        | Initial inspection                                                                                                                                                                  | Monthly for 3 months after installation                                                                                                                  |
|                              |                                        | Inspect for evidence of poor operation and/or weed growth – if required, take remedial action                                                                                       | 3 monthly, 48 hours after large storms in first 6 months                                                                                                 |
|                              |                                        | Inspect silt accumulation rates and establish appropriate brushing frequencies                                                                                                      | Annually                                                                                                                                                 |
|                              |                                        | Monitor inspection chambers                                                                                                                                                         |                                                                                                                                                          |
| Attenuation/Detention Basins | Private Ownership / Management Company | Remove litter and debris                                                                                                                                                            | Monthly                                                                                                                                                  |
|                              |                                        | Cut grass – for spillways and access routes                                                                                                                                         |                                                                                                                                                          |
|                              |                                        | Cut grass – meadow grass in and around the basin                                                                                                                                    |                                                                                                                                                          |
|                              |                                        | Manage other vegetation and remove nuisance plants                                                                                                                                  |                                                                                                                                                          |
|                              |                                        | Inspect inlets, outlets and overflows for blockages, and clean if required                                                                                                          |                                                                                                                                                          |
|                              |                                        | Inspect banksides, structures for silt accumulation. Establish appropriate silt removal frequencies                                                                                 | Annually                                                                                                                                                 |
|                              |                                        | Check any penstocks and other mechanical devices                                                                                                                                    |                                                                                                                                                          |
|                              |                                        | Tidy all dead growth before the start of the growing season                                                                                                                         |                                                                                                                                                          |
|                              |                                        | Remove the sediment from inlets, outlets and forebay                                                                                                                                |                                                                                                                                                          |
|                              |                                        | Manage wetland plants in outlet pool – where provided                                                                                                                               |                                                                                                                                                          |



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# APPENDICES



## APPENDIX K

|                                                                                                                                                                                  |                                               |                                                                             |                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------------------------------|---------------------------------------------|
| <b>Application address</b><br>Land off Barton Road Congerstone Leicestershire                                                                                                    |                                               | <b>Planning ref.</b> 23/00978/OUT                                           |                                             |
|                                                                                                                                                                                  |                                               | <b>Our ref.</b> 2023/0978/04/F                                              |                                             |
| <b>Description</b><br>Outline planning permission for the construction of up to 20 dwellings with associated infrastructure (some matters reserved except for access and layout) |                                               | <b>Consultation date</b> 18/10/2023                                         |                                             |
|                                                                                                                                                                                  |                                               | <b>Response date</b> 20/11/2023                                             |                                             |
| <b>Planning officer</b> Alex Jelley                                                                                                                                              |                                               | <b>Reviewing officer</b> Andrew Smallwood                                   |                                             |
| <b>Application type</b> Outline                                                                                                                                                  |                                               | <b>Extension requested</b> <input checked="" type="checkbox"/>              |                                             |
| <b>Refer to standing advice</b><br><input type="checkbox"/>                                                                                                                      | <b>Conditions</b><br><input type="checkbox"/> | <b>Further consultation required</b><br><input checked="" type="checkbox"/> | <b>Concerns</b><br><input type="checkbox"/> |

### Consultation checklist

| No. | Description                                                              | Check                               |
|-----|--------------------------------------------------------------------------|-------------------------------------|
| 1   | Location plan                                                            | <input checked="" type="checkbox"/> |
| 2   | Proposed layout plan                                                     | <input checked="" type="checkbox"/> |
| 3   | Evidence that the site can be drained                                    | <input type="checkbox"/>            |
| 4   | Topographic and ground investigation details                             | <input type="checkbox"/>            |
| 5   | The total impermeable area pre and post development                      | <input type="checkbox"/>            |
| 6   | All potential flood risk sources have been identified and assessed       | <input checked="" type="checkbox"/> |
| 7   | Existing and proposed peak discharge rates                               | <input type="checkbox"/>            |
| 8   | Consideration of sustainable drainage systems                            | <input type="checkbox"/>            |
| 9   | Attenuation volume calculations                                          | <input type="checkbox"/>            |
| 10  | Consideration of the maintenance and management of all drainage elements | <input type="checkbox"/>            |

### LLFA Key Observations and Advice

Leicestershire County Council as Lead Local Flood Authority (LLFA) notes that the 1.18ha greenfield site is located mostly within Flood Zone 1 being at low risk of fluvial flooding and a low risk of surface water flooding. This is except for a small section of the site to the north which is in Flood Zone 2 and 3 (medium and high risk). There are no planned development works in these

area. The proposals seek to discharge at a QBar rate to a dry detention basin to an on-site watercourse tributary of the River Sense.

Please note that the application still lacks sufficient detail for the LLFA to provide substantive comment. In order to provide a substantive response, please see our additional information and guidance, which is available here:

<https://www.leicestershire.gov.uk/environment-and-planning/flooding-and-drainage/>

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Leicestershire County Council as Lead Local Flood Authority (LLFA) advises the Local Planning Authority (LPA) that the application documents as submitted are insufficient for the LLFA to provide a substantive response at this stage.

---

### **Advice to the Local Planning Authority**

#### **1. Standing Advice – National Planning Policy Framework**

When determining planning applications, the local planning authority should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where informed by a site specific Flood Risk Assessment (FRA) confirming it will not put the users of the development at risk. Where an FRA is applicable this should be undertaken in accordance with the requirements of the National Planning Policy Framework and accompanying Planning Practice Guidance.

#### **2. Standing Advice – Consent**

Where there are any works proposed as part of an application which are likely to affect flows in an ordinary watercourse or ditch, the applicant will require consent under Section 23 of the Land Drainage Act 1991. This is in addition to any planning permission that may be granted. Guidance on this process and a sample application form can be found via the following website: <http://www.leicestershire.gov.uk/flood-risk-management>

Applicants are advised to refer to Leicestershire County Council's culverting policy contained within the Local Flood Risk Management Strategy Appendix document, available at the above link. No development should take place within 5 metres of any watercourse or ditch without first contacting the County Council for advice.

This consent does not consider local watercourse bylaws. It is the responsibility of the applicant to check if the local borough or district council has their own bylaws which the proposals will also need to consider.

#### **3. Standing Advice – Maintenance**

Note that it is the responsibility of the Local Planning Authority under the DEFRA/DCLG legislation (April 2015) to ensure that a system to facilitate the future maintenance of SuDS features can be managed and maintained in perpetuity before commencement of the works.

#### **4. Standing Advice – Greenfield Development Runoff**

For greenfield sites, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.

The runoff volume from the development in the 1 in 100 year, 6 hour rainfall event should not exceed the greenfield runoff volume for the same event. Where an increase in discharge volume is unavoidable, the proposals should discharge at QBar or provide alternative mitigation in line with CIRIA C753.

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Additional information and guidance is available here:

<https://www.leicestershire.gov.uk/environment-and-planning/flooding-and-drainage/>

*Note: Response provided by the Lead Local Flood Authority under the delegated authority of the Director of Environment and Transport.*

Hinckley & Bosworth Borough Council  
Development Services  
Hinckley Hub Rugby Road  
HINCKLEY  
Leicestershire  
LE10 0FR

**Our ref:** LT/2023/128156/01-L01  
**Your ref:** 23/00978/OUT  
**Date:** 31 October 2023

Dear Sir/Madam

**OUTLINE PLANNING PERMISSION FOR THE CONSTRUCTION OF UP TO 20  
DWELLINGS WITH ASSOCIATED INFRASTRUCTURE (SOME MATTERS  
RESERVED EXCEPT FOR ACCESS AND LAYOUT)  
LAND OFF BARTON ROAD CONGERSTONE LEICESTERSHIRE**

**Environment Agency Flood Risk position**

The proposed development will only meet the National Planning Policy Framework's requirements in relation to flood risk if the following planning condition is included.

**Condition**

The development shall be carried out in accordance with the submitted flood risk assessment (FRA, dated September 2023 Ref: 28212-FLD-0101) and the following mitigation measures it details:

- Development shall be set outside of the flood plain in FZ1, as shown on the flood map for planning - Figures 3.1, 3.2 and Appendix F and as detailed in Sections 4.8 and 5.1
- Finished floor levels shall be set no lower than 88.30 metres above Ordnance Datum (AOD) and/or 150mm above external finished ground levels (whichever is the higher) - Sections 4.10 and 5.1

These mitigation measures shall be fully implemented prior to occupation and subsequently in accordance with the scheme's timing/ phasing arrangements. The measures detailed above shall be retained and maintained thereafter throughout the lifetime of the development.

**Reasons**

- To prevent flooding elsewhere by ensuring that compensatory storage of flood water is not required, as development is located in FZ1
- To reduce the risk of flooding to the proposed development and future occupants

**Environment Agency Water Quality Position**

We object to the application as submitted because the applicant has not supplied adequate information to demonstrate that the risks of pollution posed to surface water quality can be safely managed. We recommend that planning permission should be refused on this basis.

In this case we consider that the proposed development may pose an unacceptable risk of causing a detrimental impact to surface water quality because the applicant has failed to provide a method statement detailing how surface water run-off will be dealt with during the construction phase of this development.

**Overcoming our Objection**

To overcome our objection, the applicant should submit a method statement which demonstrates that the construction run-off will be dealt with responsibly. This should be

Environment Agency  
Trent Side North, West Bridgford, Nottingham, NG2 5FA.  
Customer services line: 03708 506 506  
[www.gov.uk/environment-agency](http://www.gov.uk/environment-agency)

Cont/d..

provided to and signed off by the LPA before any permission is given to begin construction.

### **Objection 2**

We object to the proposed development as submitted because it is unclear if it involves the use of a non-mains foul drainage system in circumstances where it may be reasonable for the development to be connected to a public sewer, but no justification has been provided for the use of a non-mains system. We recommend that the application should be refused on this basis.

Private sewage treatment facilities should only be used where it is not reasonable for a development to be connected to a public sewer, because of the greater risk of failures leading to pollution of the water environment posed by private sewerage systems compared to public sewerage systems.

### **Overcoming our objection**

To overcome our objection the applicant should thoroughly investigate the possibility of connecting to the public foul sewer, and either revise their application to propose a mains connection or submit evidence that demonstrates that this is not feasible.

Yours faithfully

**Mr Niall Freeman**  
**Planning Advisor**

Direct e-mail [Niall.Freeman@environment-agency.gov.uk](mailto:Niall.Freeman@environment-agency.gov.uk)



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# APPENDICES



## APPENDIX L



**Barton Lane, Congerstone**  
**Framework Construction and Environment Management Plan**  
**Our Ref: 28212-FLD-0102**  
**December 2023**

## **INTRODUCTION**

MEC, has been commissioned by Naylor's Estate Agents (hereafter referred to as 'the Client') to undertake flood risk and drainage work to support a proposed residential development on land north of Barton Lane, Congerstone (hereafter referred to as 'the Site'). A site location plan and an illustrative masterplan are provided in Appendix A and Appendix B of the Flood Risk Assessment (FRA) report (ref. 28212-FLD-0101 Rev A).

Following the submission of the planning application (23/00978/OUT), the Environment Agency has recommended that a Construction Environment Management Plan (CEMP) is produced prior to the start of the works and submitted and approved in writing by the local planning authority. Their response to the proposed application can be seen in Appendix K of the FRA.

This report should be read in conjunction with the information provided within the documents below;

- Drainage Strategy Drawing (28212\_01\_230\_02)
- Drainage Calculation (28212-CALC-0101)
- Maintenance and Management Plan
- Flood Risk Assessment (28212-FLD-0101 Rev A)

## **DISPOSAL OF SEEPAGE, WASTEWATER AND GROUNDWATER**

Before completion of the adoptable and private foul sewer network as part of the proposed development, the Contractor shall prevent wastewater from being discharged from the site and source alternative means of disposal to avoid impact on the environment. Temporary welfare facilities, which are maintained by the supplier/hire company, shall be used during construction.

The contractor should comply with BS6031: 2009 Code of Practice for Earthworks, regarding the general control of site drainage.

The contractor will ensure wastewater that's been in contact with any contaminated materials should be removed from the site in accordance with the Water Industry Act 1991 (where dispersed to public sewers) and the Environmental Permitting Regulations (where dispersed to existing water network) and other regulations to the satisfaction of the Environment Agency, Local Authority, Lead Local Flood Authority and Sewerage Undertaker.

The following consents and approvals must be applied for by the contractor, as necessary:

- A consignment note system must be applied to all liquid wastes that are removed by a licensed waste carrier in a road tanker in accordance with all relevant waste management legislation and duty of care obligations.
- For any discharge of wastewater into a sewer, a trade effluent consent must be sought from Severn Trent Water (STW).

The contractor will make adequate provisions to ensure all hazardous substances, including oil drums or containers on site, are controlled in accordance with the Control of Substances Hazardous to Health Regulations. Appropriate labelling of such containers is essential as is having a suitable secondary containment system (SCS) in place and that no oil or other contaminants are allowed to reach watercourses or groundwater.

Foul water and sewage effluents produced by the on-site construction workforce must be contained in temporary foul drainage facilities that are to be installed and disposed of off-site by a licensed waste contractor.



## **FLOODING**

The flood map for planning shows that 91% of the site lies within Flood Zone 1 (FZ1). This means that each year this area has a chance of flooding of less than 0.1%. The other 9% of the site is located within Flood Zone 2 and Flood Zone 3. Flood Zone 2 (FZ2) is defined as land assessed as having an annual probability of river flooding between 0.1% - 1%. Flood Zone 3 (FZ3) is defined as land assessed as having an annual probability of river flooding greater than 1% if there are no flood defences. There are no flood defences in the area. The development is therefore mostly in FZ1 as no buildings will be placed in FZ2 and FZ3. Whilst the development is not considered to be at risk of flooding, the contractor must, as far as reasonably practicable, ensure flood risk (from means such as surface water, sewer surcharging and groundwater) is maintained safely for the entire construction period.

Measures to protect against flooding should include consideration of existing/proposed site flow paths, these could become active during extreme rainfall and/or sewer surcharging, especially whilst completing temporary works. Overland flow paths are determined by site topography and are shown in drawing 28212\_01\_230\_02. Operations that are vulnerable to overland flow and groundwater will be located at elevated parts of the site, away from flow paths.

In order to reduce flood risk, a flow control device should be installed immediately downstream of the installation of the attenuation basin. This must be before the final surface water connection is made to the tributary of the River Sence before connecting to the River Sence. In addition, both of these should be built at the same time or before any gullies are installed servicing hard paved surfaces within the development. All the above should take place early on in the construction process, ensuring that any overland flows can be dealt with appropriately.

## **TEMPORARY AND PERMANENT CONNECTIONS TO SEWERS/DITCHES**

Tributary of River Sence:

- Prior to construction the contractor is to ensure that the Tributary of the River Sence is clear of obstructions and free flowing.
- A silt fence (netting) is to be installed immediately prior to the new outfall to the Tributary of the River Sence, and also immediately prior to the pond outfall to the flow control manhole.
- The silt fences should be inspected weekly, repaired and replaced as necessary. Any silt or debris that has built up should be excavated/cleared.
- Proposed works are to be wholly contained within the site boundary (with the exception of works within the public highway for the site access works and foul sewer).
- Full environmental protection measures shall be included within the construction phase health and safety plan which is a requirement under the CDM regulations 2015. This shall include preventative measures for all environmental issues but in particular dust, noise, vibration, waste management, spillages, etc.
- Prior to any works starting the Tributary of the River Sence shall be checked by an appropriately qualified ecologist to ensure there are no likely impacts on wildlife by the proposed works, including for nesting birds. Should any evidence be noted appropriate mitigation, including precautionary working methods may be required.
- The contractor should undertake CBR testing to ensure the strength of the working area in all weather conditions and deploy a turf meshing system in order to adequately support construction vehicles close to areas of natural habitat such as around Tributary of the River Sence.

Proposed sewers:

- The surface water sewerage, including the attenuation pond and flow control manhole is to be constructed before all other development to ensure there is the capacity to accommodate storm events during the works. Until the attenuation is completed, no pavements will be constructed or other impermeable surfaces/buildings.
- Silt traps/fences are to be installed on the outlet of the headwall to the Tributary of the River Sence and flow control manhole to ensure any silt that flows into the new sewer system is captured prior to discharge.
- The new sewer system and outfalls are to be inspected weekly during the construction phase, to ensure that it is fully operational. Any silt/debris shall be cleared. Once installed inspections will be done annually or after



severe storms.

- Road gullies and connections from the private drainage can be constructed once the full sewer system is completed and operational. Roads, driveways and other impermeable surfaces/buildings can be constructed. All inlets are to be kept clear and protected from silt/debris.
- Proposed works are to be wholly contained within the site boundary (with the exception of works within the public highway for the site access works and foul sewer).
- A temporary screen shall be installed in the last foul manhole prior to connection to the existing foul water sewer network.
- The contractor should undertake CBR testing to ensure the strength of the working area in all weather conditions and deploy a turf meshing system in order to adequately support construction vehicles close to areas of natural habitat such as around the Tributary of the River Sence.

At the completion of the development:

- Once the proposed development is completed, along with other landscaping works the Tributary of the River Sence shall be checked, regraded, or cleared as necessary. Silt fences shall be removed.
- On completion of the proposed development, the temporary screen in the foul sewer shall be removed and any residual debris/silt shall be removed.

### **SPILL AND LEAK PROTECTION**

The contractor will ensure that a universal spill kit and an oil only spill kit are always available on-site.

An appropriate number of spill kits should be provided with this being assessed by the contractor based on the schedule and location of works taking place on the site.

Typical contents of a universal spill kit will include:

- Gloves
- Absorbent socks
- Absorbent pads
- Disposable bags and tie

Any environmentally hazardous material will be kept in dedicated stores, and storage tanks should have appropriate bunding to prevent run-off into retained habitats.

Fuel stored on site will be stored in double bunded fuel tanks. Spill kits will be readily available if required.

Any spillages (e.g. diesel) should be cleaned up immediately. Efforts will be made to stop a spill at the source. If the primary container or secondary containment have been breached or failed for any reason, the spill will be contained where it is happening. This will reduce the quantity of material released, reducing the amount of spilt material that can cause pollution.

If it is not possible to stop the spill at source, significant attempts will be made to stop it as close to the source as possible. If possible, the spilling material will be safely moved into another container to limit the size of the spill. Use of a suitable container and pump should be kept on site.

In the event of a spillage on site, the material should be contained (using an absorbent material such as sand or soil or commercially available booms). Sorbents will be used to soak up a spill and stop it spreading on hard surfaces. Using sorbents generates waste and this method will only be used on small spills, or where a spill has been contained to stop any further spread. All used sorbents will be disposed of at an accredited site for disposal.

## MAINTENANCE REGIME

A proposed maintenance plan is shown in Table 1 that breaks down the maintenance responsibility during construction, based on good practice and general current procedures.

**Table 1: Maintenance Regime During Construction**

| Drainage Asset                    | Maintenance Work                                                                                                                                           | Frequency                                                           |
|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| Tributary of the River Sence      | Check and maintain the existing structure to ensure that it is clear of debris and that construction activity has not affected its existing size or shape. | During site clearance and at monthly intervals.                     |
|                                   | Check the brook for pollutants which might have been conveyed from the development works                                                                   | During site clearance and at monthly intervals.                     |
| Existing STW Manhole (ref.MH0602) | Inspect the existing manhole and repair any defects.                                                                                                       | Before and upon completion of connection works                      |
|                                   | Inspect the existing manhole, proposed pipe connection and temporary screen for debris, silt or pollution.                                                 | Completion of drainage network; following final occupation on site. |

## REGISTRATION OF AMENDMENTS

| Date          | Rev | Comment     | Prepared By                                                                        | Checked By                                                     | Approved By                                           |
|---------------|-----|-------------|------------------------------------------------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------|
| December 2023 | -   | First Issue | <b>Ben Oyston,</b><br><b>MSc (Hons) BSc (Hons)</b><br>Graduate Flood Risk Engineer | <b>Ryan Chafer</b><br><b>BSc (Hons)</b><br>Flood Risk Engineer | <b>Tim Rose</b><br><b>BA (Hons), MTPS</b><br>Director |

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TRANSPORT



FLOOD RISK & DRAINAGE



STRUCTURES



GEO-ENVIRONMENTAL



ACOUSTIC AIR



UTILITIES



GEOMATICS



LIGHTING



EXPERT WITNESS



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