Dice

Mill Lane, Bolsover

Flood Risk Assessment

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Flood Risk Assessment

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This Flood Risk Assessment has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) (Ref. 4), Planning Practice Guidance (PPG)(Ref. 16) and the Environment Agency's Flood Risk Assessment (EAFRA) Guidance Notes and the best practices in flood risk management.

The development proposal will comprise a full planning application consisting of approximately 32no. new residential dwellings and associated infrastructure.

The Indicative Flood Maps show that the site is located within Flood Zone 1 and therefore has an annual probability of fluvial and tidal flooding of less than 1 in 1000 (<0.1%).

The vulnerability of the development to flooding from all other sources, such as fluvial, underground water, sewerage and reservoir has been assessed. It is considered that all sources pose a low risk to the development subject to the recommended mitigation measures being implemented.

Drainage Strategy

Infiltration testing on site recorded infiltration rates of 3.40 x 10^{-6} m/s at SA6, which was an extrapolated result as the test could not be completed and 1.31 x 10^{-5} m/s at SA7. Tests could not be undertaken for the remainder of the locations due to the presence of deep made ground at depths as deep as 3.8m below ground level (bgl). Rates in the region of 10^{-6} m/s show a very limited potential for soakaway type drainage. Furthermore, the presence of deep made ground under a large portion of the site proves highly restrictive. Based on the above, infiltration type drainage is deemed unfeasible for this development, with the exception of a small portion of the site to the north at the location of SA7 where private soakaways could be used to drain approximately 4 plots.

The surface water drainage will consist of an adoptable gravity system outfalling to the existing combined water sewer within Mill Lane. The system will provide attenuation for flows up to a 1 in 100-year storm event (+40% allowance for climate change). The proposed surface water strategy will not increase flood risk at the site or elsewhere.

Similar to surface water, the proposed foul water system will collect discharges generated by the proposed development and convey them towards the existing combined water public sewer within Mill Lane.

1.0 Introduction

1.1 Dice Consulting Engineers Ltd (Dice) has been commissioned by Robert Woodhead Ltd. to undertake a Flood Risk Assessment (FRA) for a proposed residential development on a site at Mill Lane, Bolsover.

1.2 This FRA has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) (Ref. 4), Planning Practice Guidance (PPG) (Ref. 16) and the best practices in flood risk management.

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

- Proposed Site Layout Plan;
- National Planning Policy Framework (NPPF);
- Practical Guidance to the NPPF;
- Chesterfield, Bolsover and North East Derbyshire Strategic Floor Risk Assessment (CBDSFRA);
- Derbyshire Preliminary Flood Risk Assessment 2011 (DPFRA);
- Derbyshire Local Flood Risk Management Strategy Part 1 2014 (DLFRMS);
- Derbyshire County Council and Derby City Council Strategic Flood Risk Assessment – Level 1, August 2012;
- British Geological Survey Mapping;
- Indicative Flood Maps from Environment Agency (EA) website;
- Yorkshire Water (YW) public sewer records;
- Topographical Survey.

1.4 All comments and opinions contained in this report, including any conclusions, are based on the information available to Dice at the time of writing the report. The conclusions drawn by Dice could therefore differ if the information is found to be inaccurate, incomplete or misleading. Dice accepts no liability should this prove to be the case, or, if additional information exists or becomes available with respect to this site.

1.5 Dice has completed this report for the benefit of the organisations/individuals referred to in paragraph 1.1; and any relevant Statutory Authority which may require reference in relation to approvals for the proposed redevelopment of the site. Other third parties should not use or rely upon the contents of the report unless written approval has been gained from Dice.

1.6 Dice accepts no responsibility or liability for:

a) the consequences of this documentation being used for any purpose or project other than that for which it was commissioned, and;

b) this document to any third party with whom approval for use has not been agreed.

2.0 Site Description

Site Location & Surroundings

2.1 The site is located in the northern part of Bolsover, approximately 9 km to the east of Chesterfield Town centre, grid reference X:447505, Y:371318.

Figure 1 – Site Location Plan

Site Description

2.2 The site is brownfield and covers an approximate area of 1.28ha. It is bound by Mill Lane and a newly built residential development to the north, a commercial property to the west, playing fields to the south and residential properties to the east. Access to the site is currently achieved from Mill Lane via two bell mouth access roads.

2.3 The site is located wholly within the Bolsover District Council and Derbyshire County Council (DCC) boundaries, with the DCC acting as the Lead Local Flood Authority (LLFA) for the site.

Topography

2.4 The sites topography is relatively sloped, falling from east to west across the site, with levels varying between approximately 168.6m above ordnance datum (AOD) in the south-eastern

corner and 165.60m AOD to the south-west. A copy of the topographical and utilities survey is included in **Appendix A**.

Proposal

2.5 Scheme proposals consist of the construction of approximately 32no. residential dwellings and associated infrastructure. The impermeable area of the proposed site is approximately 0.605ha including a 10% allowance for urban creep. An illustrative masterplan is provided in **Appendix B**.

Geology

2.6 The 1:50,000 British Geological Survey (BGS) maps show that the site is underlain by the Zechstein bedrock group – dolomitised limestone and dolomite.

2.7 The borehole logs for the site, produced by Enzygo Ltd. in April 2020, identify fairly shallow Made Ground consisting asphalt concrete and firm, slightly gravelly sandy clay, and underlain by slightly clayey sand and limestone to the south and very deep Made Ground to the north of the site. The borehole logs are included in **Appendix C**.

Hydrology and Hydrogeology

2.8 The closest main river to the site is the River Doe Lea, which is located approximately 1.6km west of the site, flowing in northerly direction. The closest ordinary watercourses to the site are located approximately 0.76km to the north-west and south-west of the application site's boundary, and are understood to flow in a westerly direction before joining the River Doe Lea. There are no other watercourses within the vicinity of the site and nothing that poses a significant fluvial flood risk.

2.9 The site does not fall within any Groundwater Source Protection Zones as designated by the Environment Agency.

Existing Drainage

2.10 Yorkshire Water (YW) is responsible for the operation and maintenance of the public sewers within the local area. A copy of the sewer record plans, and other correspondence received from YW are shown in **Appendix D**.

2.11 Public sewer records indicate that there are no public sewers within the site boundary. However, there are both surface water and combined water public sewers running underneath Mill Lane, as well as combined water sewers within the back gardens of the neighbouring properties and across the adjacent commercial property.

2.12 The site is currently being drained via private combined and surface water drains serving the existing buildings and hardstanding areas, which partially outfall to existing soakaways and partially to the public combined sewers within Mill Lane.

Water Bodies

2.13 The nearest standing water body to the site is the Call Vale Nature Reserve Lake located approximately 2.1km south-west of the application site.

2.14 Environment Agency 'Risk of flooding from Reservoirs' maps indicate that there are no reservoirs that would pose a flood risk to the proposed development.

3.0 Policies

3.1 This FRA has been carried out in accordance with the requirements of the National Planning Policy Framework (NPPF) (Ref. 4), Planning Practice Guidance (PPG) (Ref. 16) and the Environment Agency's Flood Risk Assessment (EAFRA) Guidance Notes and the best practices in flood risk management.

National Planning Policy Framework (NPPF)

3.2 The National Planning Policy Framework (Ref. 4) sets out the Government's objectives for the planning system and how there should be a 'Presumption in Favour of Sustainable Development' and the planning system should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. The document seeks to ensure that flood risk is considered at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Reference should also be made to the Planning Practice Guidance (Ref. 18) which provides additional guidance on flood risk.

3.3 For the purposes of applying the National Planning Policy Framework, areas at risk from all sources of flooding are included. For fluvial (river) and sea flooding, this is principally land within Flood Zones 2 and 3. It can also include an area within Flood Zone 1 which the Environment Agency has notified the local planning authority as having critical drainage problems.

3.4 The Flood and Water Management Act helps 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.

Flood and Water Management Act 2010

3.5 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 – 2015

3.6 The Government's 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.

3.7 The changes follow a joint Defra/DCLG consultation on delivering SuDS published in September 2014 in which the Government dropped all the key provisions of Schedule 3 of the Flood & Water Management Act 2010 and SuDS Approval Bodies (SABs) in favour of passing oversight of SuDS from county councils (who are also LLFAs) to local planning authorities. According to the new planning policy, 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;
- To ensure using planning conditions or planning obligations that there are clear arrangements in place for ongoing maintenance over the lifetime of the development.

3.8 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

3.9 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 - 2015.

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

Strategic Flood Risk Assessment for Chesterfield, Bolsover and North East Derbyshire – March 2009

3.11 Faber Maunsell and AECOM were comissioned to undertake a Strategic Flood Risk Assessment (CBDSFRA) for the Chesterfield, Bolsover and North East Derbyshire areas. The CBDSFRA identifies the River Doe Lea as the watercourse that poses the greatest flood risk in Bolsover with an area close to Pinxton which is believed to be at potential risk of breach.

3.12 The CBDSFRA contains a map showing the historical flood events in the area by source and shows that the nearest recorded flood event to site was caused by multiple sources and was located approximately 500m to the south west of the development boundary. No other historical flood events have been identified in the CBDSFRA.

Derbyshire County Council Preliminary Flood Risk Assessment – 2011

3.13 The Derbyshire County Council Preliminary Flood Risk Assessment (DCCPFRA) has been prepared in accordance with the Flood Risk Regulations 2009, which implement the requirements of the European Union Floods Directive. The aim of the European Floods Directive is to provide a consistent approach to managing flood risk across Europe. It establishes four

stages of activity within a six-year flood risk management cycle and the PFRA is the first stage of this cycle.

3.14 The DCCPFRA has assessed historic and future flooding within Derbyshire and presents the risk of flooding from local sources and surface water.

3.15 The DCCPFRA shows a map of historic flood events in Derbyshire at 1 km squares where historic flood events have been recorded. The proposed site falls outside of all of the locations where flooding has occurred.

3.16 No other potential sources of flooding are identified for the area in the PFRA.

4.0 Flood Risk to the Site

Fluvial Sources

4.1 The site has been checked in accordance with the Indicative Flood Maps, which give guidance for fluvial and tidal flood risk. The results are shown in Figure 2 below.

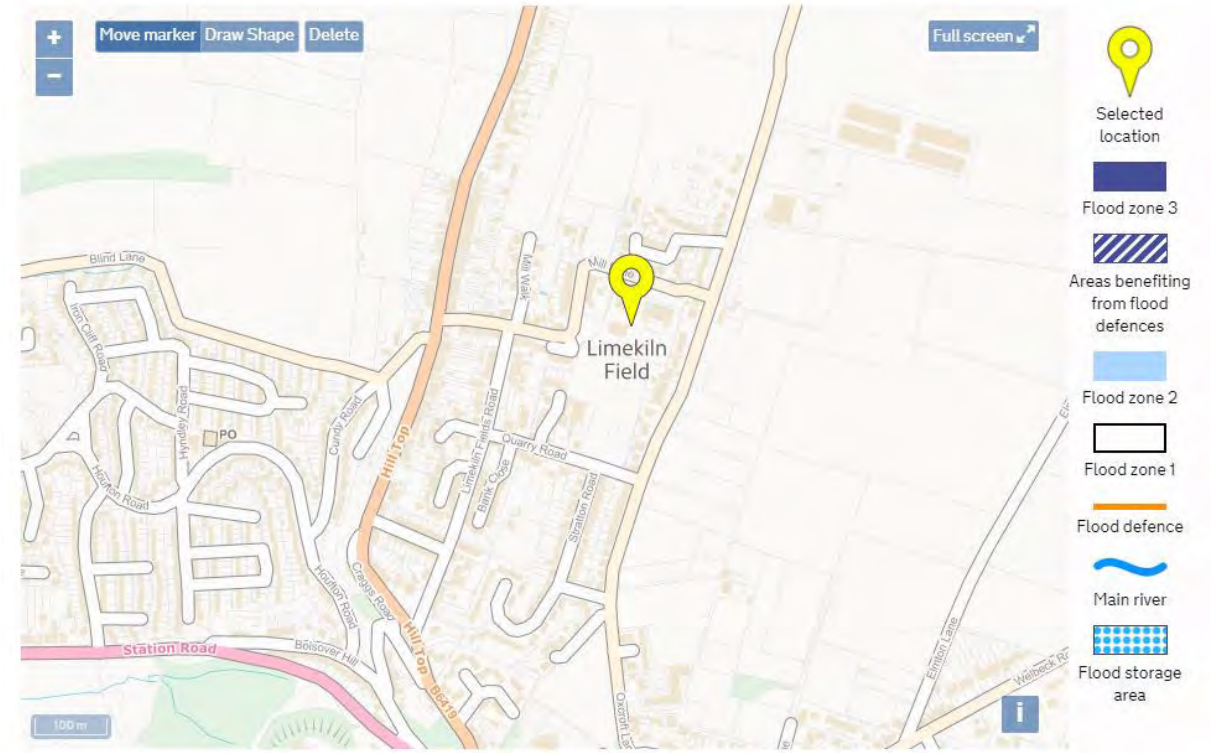


Figure 2 - Environment Agency Flood Map for Planning (Rivers and Sea)

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

4.2 The Indicative Flood Maps show that the site is located within Flood Zone 1 and therefore has an annual probability of fluvial and tidal flooding of less than 1 in 1000 (<0.1%).

4.3 The proposed development is to consist of approximately 32no. new residential dwellings and associated infrastructure. As such the development is classified as 'more vulnerable' as per Table 3 Flood Risk Vulnerability and Flood Zone 'Compatibility' from the National Planning Practice Guidance (Ref. 19). A proposed site layout is provided in **Appendix B**.

4.4 In accordance with the National Planning Policy Framework (NPPF), the aim of a Sequential Test should be to direct any new development to Flood Zone 1. Should there be no reasonable sites available in Flood Zone 1, taking into consideration the flood risk vulnerability of land use, the Local Authority should consider reasonable sites available in Flood Zone 2, where the Exception Test is applied if required. Should there be no reasonable sites available in Flood Zone 1 & 2, taking into consideration the flood risk vulnerability of land use, the Local Authority should consider reasonable sites available in Flood Zone 3, where the Exception Test is applied if required.

4.5 The NPPF states that the Exception Test is a method to help ensure and demonstrate that, where suitable sites at lower risk of flooding are not available, any flood risk to people and property will be managed without stopping the development from progressing on site. The two requirements that need to be met for the Exception Test are:

a. The development would provide wider sustainability benefits to the community that outweigh the flood risk; and
b. The development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

4.6 As the proposals consist of the construction approximately 32no. new residential dwellings situated within Flood Zone 1, the Sequential and Exception Tests will not be required for this site.

	Flood Risk Vulnerability classification (see Table 2)	Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	More vulnerable
Flood Zone	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test Required	✔	✔
	Zone 3a	Exception Test Required	✔	x	Exception Test Required	✔
	Zone 3b 'Functional Floodplain'	Exception Test Required	✔	x	x	x

Key:

✓ Development is appropriate

x Development should not be permitted

Table 1 - Copy of Table 3 (Flood Risk Vulnerability and Flood Zone 'compatibility') from the Planning Practice Guidance (Ref. 16)

Pluvial Flooding

4.7 Pluvial flooding occurs when natural and engineered systems have insufficient capacity to deal with the volume of rainfall. Pluvial flooding can sometimes occur in urban areas during an extreme, high intensity, low duration summer rainfall event which overwhelms the local surface water drainage systems, or in rural areas during medium intensity, long duration events where saturated ground conditions prevent infiltration into the subsoil. This flood water would then be conveyed via overland flow routes dictated by the local topography.

4.8 The Environment Agency Risk of Flooding from Surface Water mapping for the site area is shown in Figure 3 below. The map indicates the site to be in an area of very low probability of flooding with a small area of low probability (between 1 in 100 year and 1 in 1000 year) located in the centre of the site.

4.9 A balanced earthworks scheme and a sustainable drainage system will reduce or eliminate the flood risk from surface water on site. The site would be designed to convey any exceedance flows towards the new highway and away from the newly proposed and existing properties.

4.10 The risk of surface water flooding for the site is considered low for the design storms.

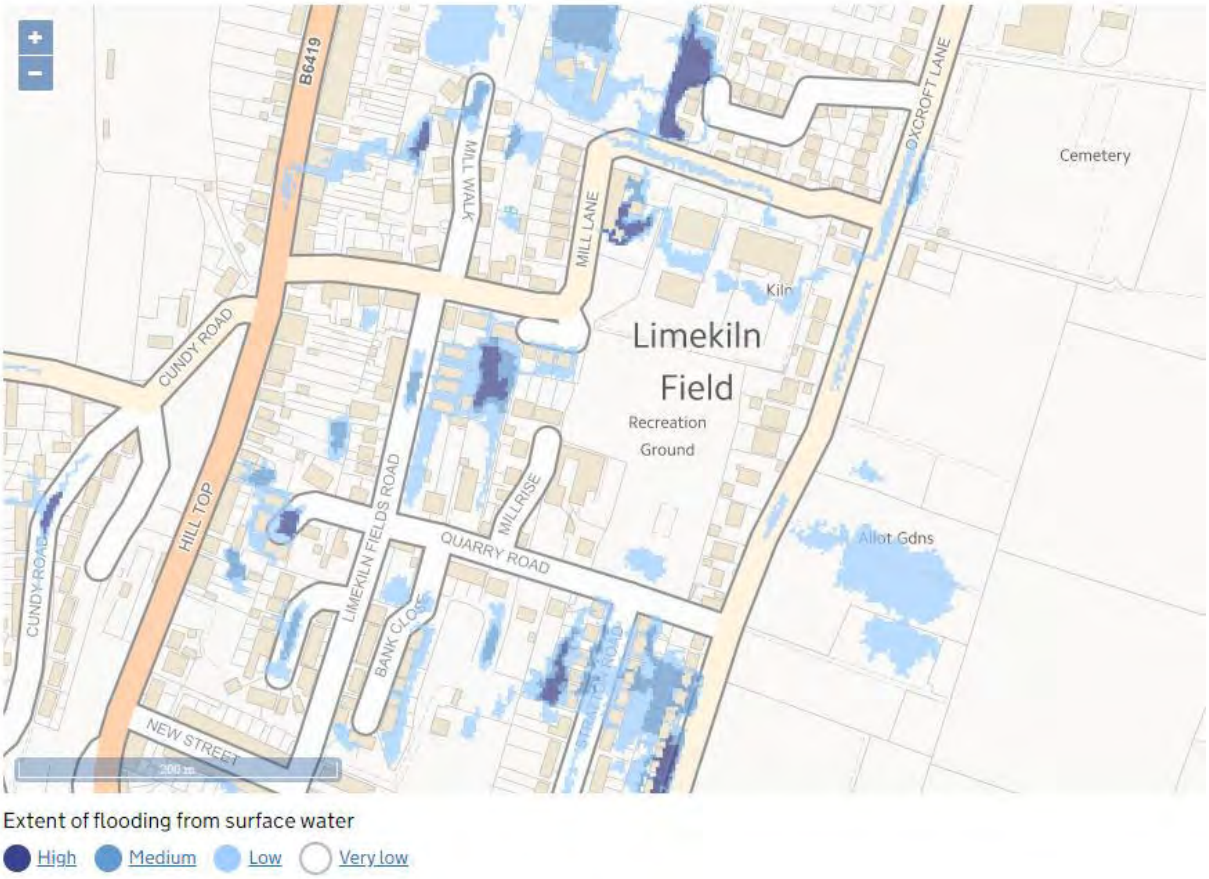


Figure 3 - Environment Agency Flood Mapping – Risk of Flooding from Surface Water

Sewer Sources

4.11 The site's low point is located within its south-western corner. The sewers within Mill Lane and the adjacent commercial property receive run-off from only a small area upstream and fall towards the lower Hill Top further to the west. Any potential sewer flooding is likely to occur further downstream. In the unlikely case that sewer flooding occurs within Mill Lane, the overflow will be conveyed further to the west and away from the site.

4.12 The pre-development enquiry response issued by YW confirms that there is available capacity within the public sewers around the site and does not identify any capacity issues or historical flood incidents in the area. YW's pre-development enquiry response can be seen in **Appendix D**.

4.13 It is therefore concluded that the risk of sewer flooding on site is considered low.

Tidal/Coastal

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

Groundwater Sources

4.15 Groundwater flooding occurs as a result of water rising from the underlying aquifer or from water flowing from abnormal springs. This can occur after long periods of sustained high rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at shallow depth. Groundwater flooding is known to occur in areas underlain by major aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels.

4.16 No groundwater was encountered as part of the site investigation works undertaken by both Solmec in October 2019 and Enzygo in April 2020. Even if groundwater were to emerge on site, the proposed site levels would be designed to convey exceedance flood flows towards the development highway and further beyond to the existing public highways.

4.17 It is therefore concluded that the risk of groundwater flooding at the application site is considered low.

Artificial Water Bodies

4.18 Reservoir flooding may occur when a large reservoir fails and releases the water it holds. The Environment Agency defines a large reservoir as one that holds over 25,000m^3 of water and states that such a failure is extremely unlikely.

4.19 Environment Agency 'Risk of flooding from Reservoirs' maps indicate that there are no reservoirs that would pose a flood risk to the proposed development.

Historical Flooding

4.20 The CBDSFRA contains a map with high-level flooding history across Derbyshire. However, the extent of information shown on the map is highly insufficient to provide any meaningful information on the historical flood occurrences on site.

4.21 A search of the available online sources did not highlight any areas that have been affected by flooding in the immediate vicinity of the site.

5.0 Flood Risk from the Development

5.1 The requirements of a Site-Specific Flood Risk Assessment, as outlined in the National Planning Practice Guidance (Ref. 19), should assess the following off-site impacts.

- How will it be ensured that the proposed development and the measures to protect the site from flooding will not increase flood risk elsewhere?
- How will run-off from the completed development be prevented from causing an impact elsewhere?
- Are there any opportunities offered by the development to reduce flood risk elsewhere?

5.2 The primary flood risk generated by the new development is most likely to be the risk posed to others by surface water runoff.

Existing Discharges

5.3 The site is currently brownfield and has an approximate area of 1.28ha. The existing ground surface is mostly covered by existing hardstanding areas and buildings which are being drained via private combined and surface water drains. Approximately 0.1541ha of existing impermeable area currently drains to the public sewers with the remainder draining to existing soakaways.

5.4 The existing run-off rate from site was calculated to be approximately 15l/s and was calculated using the modified rational method using 0.1541ha impermeable area.

Climate Change

5.5 Environment Agency 'Flood Risk Assessments – Climate Change Allowances' provides support to the National Planning Policy Framework (Ref. 7) on the impacts of climate change on flooding from the land, rivers and sea as part of a flood risk assessment. The recommended sensitivity ranges in Tables 1 to 4 provide an appropriate precautionary approach to the uncertainty about climate change impacts on rainfall intensities, river flow, wave height and wind speed.

5.6 Table 2 shows anticipated changes in extreme rainfall intensity in small and urban catchments. For flood risk assessments and strategic flood risk assessments, both the central and upper end allowances should be assessed to understand the range of impact.

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Peak Rainfall Intensity	10%	20%	40%
Peak River Flow	5%	10%	20%

Table 2 - Copy of Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline) from Environment Agency 'Flood Risk Assessments – Climate Change Allowances'

5.7 When considering the assumed 100-year lifetime of residential type developments, up to a 40% climate change allowance is appropriate for peak rainfall intensities up to 2115.

Proposed Discharges

5.8 The discharge rate from site is proposed to be restricted to 10.5l/s which takes into account 30% betterment to the existing run-off rate. The total area of the site is approximately 1.28 ha, of which 0.605ha including 10% allowance for urban creep is proposed to be impermeable.

6.0 Consideration of Sustainable Drainage Systems

Surface Water

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

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

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

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

6.4 Infiltration testing on site recorded infiltration rates of 3.40 x 10^{-6} m/s at SA6, which was an extrapolated result as the test could not be completed and 1.31 x 10^{-5} m/s at SA7. Tests could not be undertaken for the remainder of the locations due to the presence of deep made ground at depths as deep as 3.8m below ground level (bgl). Rates in the region of 10^{-6} m/s show a very limited potential for soakaway type drainage. Furthermore, the presence of deep made ground under a large portion of the site proves highly restrictive. Based on the above, infiltration type drainage is deemed unfeasible for this development, with the exception of a small portion of the site to the north at the location of SA7 where private soakaways could be used to drain approximately 4 plots.

6.5 A copy of the infiltration test results and groundwater monitoring can be found in **Appendix E**.

6.6 The National Standards Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems – March 2015 (Ref. 15) that deals with SuDS which covers the whole range of sustainable approaches to surface water drainage management including:

- Source control measures including rainwater recycling and drainage;
- Infiltration devices to allow water to soak into ground, that can include individual soakaways and communal facilities;
- Filter strips and swales, which are vegetated features that hold and drain water downhill mimicking natural drainage patterns;
- Filter drains and porous pavements to allow rainwater and run-off to infiltrate into permeable material below ground and provide storage if needed; and
- Basins and ponds to hold excess water after rain and allow controlled discharge that avoids flooding.

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

SuDS Measures	Component	Feasibility for the site	Issues/ Description
Source Control	Rainwater Harvesting	Yes	Use may be considered but would only mitigate a small proportion of the increase in volume of runoff created by the proposed development. Rainwater butts can be used to save water use.
Infiltration Devices	Permeable paving	No	Permeable paving has limited benefit for attenuation in private car parking bays for the size of this development and increases maintenance cost/ issues.
	Private soakaways	Yes	Infiltration potential is limited on site, hence it has been concluded that only a small portion of the site is suitable to support soakaways.
Filtration	Open Swales	No	Due to available space constraints it has been concluded that swales will not be viable for this site.
	Filter Strips	No	Due to available space constraints within the site, it has been concluded that filter strips will not be viable for this site.
Retention/ Detention	Detention Basins	No	Due to the limited available space on site, detention basins will not be feasible for this site.
	Attenuation Ponds	Yes	Due to the fairly consistent topography of the site, attenuation ponds are considered feasible.

Table 3 – General Assessment of SuDS measures for the site

6.8 Based on the general assessment of the potential SuDS measures listed above, it is proposed that an attenuation pond will be implemented in order to improve the surface water runoff from the site.

6.9 It is proposed that flows generated by the new development shall be attenuated within suitably sized adoptable attenuation pond before discharging off site into the public combined water sewer within Mill Lane.

7.0 Drainage Strategy

Surface Water

7.1 The surface water strategy proposes that run off arising from the developed site will be managed in a sustainable manner and will include attenuation to restrict run-off rates for storms up to the 1 in 100-year (+40% allowance for climate change) return period event.

7.2 The surface water strategy consists of an adoptable surface water sewer system that will collect runoff from the development areas, then drain into the existing public sewers within Mill Lane via a new direct connection. An attenuation pond will be used to treat run-off from private drives and car parking areas within the site.

7.3 The MicroDrainage Network module was used to calculate the attenuation storage volumes requirements on site for the 1 in 100 years storm event plus 40% allowance for climate change and impermeable area of 0.605ha (including 10% allowance for urban creep). This has been calculated as approximately 305m^3 and is to be accommodated within an attenuation pond.

7.4 Should the capacity of the sewer system and storage be exceeded, the excess flow will be diverted overland away from properties.

7.5 The surface water run-off from the proposed impermeable area is to be controlled to the proposed discharge rate of 10.5l/s, using an adoptable hydro-brake flow control.

7.6 The surface water drainage calculations can be found in **Appendix F**.

7.7 The surface water connections to the existing public combined water sewers will be subject to Section 106 Agreements with YW.

7.8 The proposed surface water drainage strategy is shown on drawing 100412_01_0500_01 in **Appendix G**.

Foul Water

7.9 Similar to the surface water strategy, the proposed adoptable foul water system will collect discharges generated by the proposed development and convey them towards the existing combined water public sewers within Mill Lane.

7.10 The foul water connection to the existing public combined water sewer will be subject to Section 106 Agreements with YW.

7.11 The proposed foul water drainage strategy is shown on drawing 100412_01_0500_01 in **Appendix G**.

CIRIA Document C753

7.12 Table 26.2 of The SuDS Manual CIRIA document C753 (Ref. 10), as shown below, indicates the minimum treatment indices appropriate for contributing pollution hazards for different land use classifications (see Tables 4 & 5). To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index.

	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 (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day	Low	0.5	0.4	0.4

Table 4 – CIRIA 753 Table 26.2 Pollution Hazard Indices

Type of SuDS component	Total Suspended Solids	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bio-retention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 5 – CIRIA 753 Table 26.3 Indicative SuDS Mitigation Indices

7.13 For a residential type development, roof water requires a very low treatment of 0.2 for total suspended solids, 0.2 for heavy metals and 0.05 for hydrocarbons, and run-off from low traffic roads such as cul-de-sacs and individual property driveways requires low treatment of 0.5 for total suspended solids, 0.4 for heavy metals and 0.4 for hydrocarbons.

7.14 To provide the correct level of treatment, an assessment needs to be made of the mitigation provided by each SuDS feature. Table 26.3 of The SuDS Manual CIRIA document C753 shown below indicates the treatment provided by each SuDS feature.

7.15 The treatment train combination will be determined at detailed design stage but is likely to incorporate the following components and will provide sufficient mitigation to negate the site designed pollution indices;

- Attenuation pond will be provided to treat surface water across the site.

Maintenance

7.16 The proposed surface water and foul water drainage on site, are to be adopted and therefore maintained by Yorkshire Water.

7.17 A maintenance agreement for the site will be formulated with an approved Management Company for the SuDS features. In any eventuality, it is considered the SuDS features will be maintained in perpetuity.

8.0 Flood Mitigation Measures

8.1 The development layout, drainage networks and levels of the proposed development are to be designed to direct overland flow through the development and away from proposed buildings. A detailed layout and levels design will play a significant part in the management of any residual risk of flooding to the development, for example due to blockage or failure of drainage systems.

8.2 The flood risk management measures included on the proposed development site will include the following:

- The proposed development will include a surface water drainage system that will intercept the majority of run-off generated within the development roads. This will minimise the risk to the new buildings and also reduce the incidence of overland flows. Storage will be provided up to the 1 in 100 years critical storm event + 40% allowance for climate change through an attenuation pond;
- Where possible all buildings must be designed with the finished floor level at least 150mm above adjacent external ground levels and raised above the proposed access road;
- Where possible, the external ground profile should be designed to slope away from the buildings to divert any flows away from vulnerable areas. Where flush thresholds are required, these must be achieved using a suitable ramp to ensure that water will not be able to use this route to enter the building.

9.0 Conclusions

9.1 Dice Consulting Engineers Ltd (Dice) has been commissioned by Robert Woodhead Ltd. to undertake a Flood Risk Assessment (FRA) for a proposed residential development on a site at Mill Lane, Bolsover.

9.2 The Indicative Flood Maps show that the site is located within Flood Zone 1 and therefore has an annual probability of fluvial and tidal flooding of less than 1 in 1000 (<0.1%).

9.3 The vulnerability of the development to flooding from all other sources, such as fluvial, underground water, sewerage and reservoir has been assessed. It is considered all these sources pose a low risk to the development subject to the recommended mitigation measures being implemented.

9.4 The surface water strategy consists of an adoptable surface water sewer that will collect runoff from the development areas, then drain into the existing public combined water sewers within Mill Lane. An adoptable attenuation pond will be used to attenuate and treat run-off from the site's impermeable areas.

9.5 The surface water system will provide attenuation for flows up to a 1 in 100 years storm event (+40% allowance for climate change). The proposed surface water strategy will not increase the flood risk at the site or elsewhere.

9.6 The proposed foul water system will collect discharges generated by the proposed development and convey them towards the existing combined water sewers within Mill Lane.

9.7 The overall flood risk as a result from the development of the site is considered low, and the is considered appropriate for the proposals.

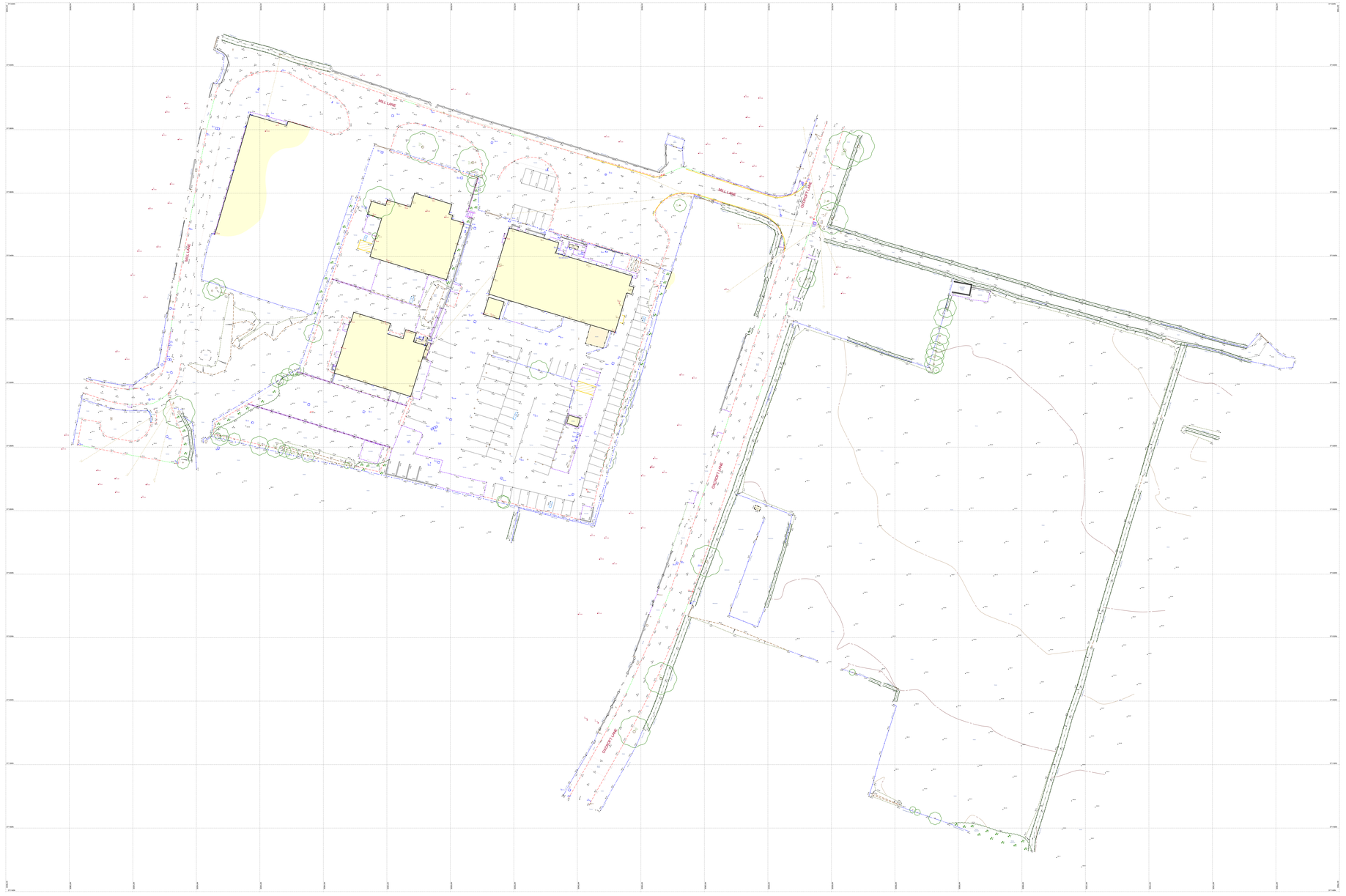
10.0 References

The following documents have been referred to in this report:

1. The Building Regulations 2015 Approved Document H
2. Sewers for Adoption 7th Edition
3. Civil Engineering Specification for the Water Industry, 7th Edition
4. National Planning Policy Framework (NPPF) – March 2012
5. Environment Agency Flood Risk Standing Advice
6. Environment Agency 'Flood Risk Assessments – Climate Change Allowances' - February 2016
7. The SuDS Manual – CIRIA C753
8. Interim Code of Practice for Sustainable Drainage Systems – National SuDS Working Group, July 2004
9. British Geological Survey – Geology of Britain viewer http://mapapps.bgs.ac.uk /geologyofbritain/home.html
10. Design and analysis of urban storm drainage. The Wallingford Procedure Vol.1
11. Institute of Hydrology Report No. 124 – Flood Estimation for small catchments
12. BRE Digest 365: 2007 – Soakaways
13. Flood and Water Management Act 2010
14. Water Industry Act 1999
15. Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems – March 2015
16. Planning Practice Guidance – Flood Risk and Coastal Change, updated April 2015.
17. The National Strategy on Sea Defences, Flooding and Coastal Erosion 2016.
18. Environment Agency Coastal Flood Boundary Conditions and Island Project 2011
19. Environment Agency web based interactive maps, http://maps.environemt-agency.gov.uk

Appendices

Appendix A



N

Station Information:

Station	Easting (m)	Northing (m)	Level (m)
GH1	447411.330	371296.953	165.745
GH2	447437.472	371397.238	164.958
GH3	447483.023	371390.017	165.575
GH4	447455.953	371291.040	167.985
GH5	447542.971	371266.569	168.523
GH6	447566.591	371365.709	168.430
GH7	447614.563	371351.842	169.232
GH8	447576.422	371234.510	168.636

OS Note:

Some services may have been omitted due to parked vehicles. The Ordnance Survey tile is to be used as a guide only.

OS Buildings *Surveyed Buildings*

This survey has been orientated to the Ordnance Survey (O.S) National Grid OSGB36(15) via Global Navigation Satellite Systems (GNSS) and the O.S. Active Network (OS Net).

A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15GB & OSGM15GB transformation models.

The survey has been correlated to this point and a further one or more OSGB36 (15) points established to create a true O.S bearing for angle orientation.

No scale factor has been applied to the survey therefore the coordinates shown are arbitrary & not true O.S. Coordinates which have a scale factor applied.

Please refer to Survey Station Table to enable establishment of the on-site grid and datum.

Legend:

Building
Edge
Kerb line
Top of bank
Drop kerb
Centre line
Edge
Top of bank
Bottom of bank
Station and Name
100.000 Station Level
Tree / Bush / Sapling
Area of Undergrowth
Woodland
R Ridge Level
E Eaves Level
F Flat Roof Level
Gate

Fence types:
SW Stanncrete
SR Iron Railings
WM Wire Mesh
PIR Post & Rail
PIW Post & Wire
CHL Chain Link
WP Wooden Panels
CVB Close Boarded
SP Steel Palisade

OHL Overhead Cable
Edge
Concrete edge
Tarmac edge
Edge
Grass verge
Concrete edge
Tarmac edge
Edge
Bottom of bank
Station and Name
Station Level
Tree / Bush / Sapling
Area of Undergrowth
Traffic light
Bus stop
Stop valve
Stop tap
Earth rod
Water meter
Gas valve
Air valve
Unidentified inspection
Wash out
Rodding eye
Bollards beacon
Marker post
Gas marker post
Soil pipe
Fire hydrant

IC Inspection chamber
Pole Pole
Gully
Back gully
Down pipe
Pipe Pipe above ground
MH Manhole
WL Water level
FL Flood light
Lp Lamp post
Tp Telegraph post
Ep Electricity post
TL Traffic light
Bus Bus stop
Sv Stop valve
St Stop tap
Er Earth rod
Wm Water meter
Gav Gas valve
Av Air valve
ICU Unidentified inspection
Wo Wash out
Ro Rodding eye
BB Bollards beacon
Mkr Marker post
GMar Gas marker post
So Soil pipe
Fh Fire hydrant

Bol Bollard
IB Illuminated bollard
Bin Rubbish bin
Vp Vent pipe
GL Ground light
Llove Letter box
Strop Tree Stump
Sty Stile
IFL Internal floor level
TFL Threshold level
Sp Sign post
TH Trashcans
BH Beanstalk
ELC Electric
BT British Telecom
Chow Control box
TT Tactile
BP Brick paved
CPS Concrete paving slabs
CVR Cover
Rwall Retaining wall
TWL Top of Wall Level
TCL Tree canopy level
G Grille
MG Multi grille
IC Inspection chamber
CL Cover level
IL Invert level
UTL Unable to lift

Rev	Date	Description	Drawn	Q. Ref

greenhatch group

- Topographical Surveys
- Site Engineering
- Utility / CCTV Surveys
- Measured Building Surveys
- 3D Laser Scanning
- Revit & BIM Models

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Newcastle
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Newcastle-U-Tyne
NE4 7YL
t. (01912) 736391

London
27, Cornwall Terrace Mews
Regents Park
London
NW1 5LL
t. (02072) 241806

CLIENT
Robert Woodhead Ltd

PROJECT
Oxcroft & Mill Lane
Bolsover
S44 6DJ

TITLE
Topographical Survey

SCALE	DATE
A0@ 1: 500	09.03.2020
DRAWN	QUALITY REF
JOS	GH7159

Level datum	See note
Grid orientation	See note
Job number	36335

Drawing No. 36335_T Rev. 0

Comments
This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

N

NOTES:

UTILITY LINETYPES

UTILITY SURVEY INFORMATION

LEGEND

PAS 128 : 2014

SURVEY CATEGORY	QUALITY LEVEL	CRITERIA USED IN THE DETERMINATION OF QUALITY LEVEL
TYPE B - DETECTION	QL-B4	A UTILITY SEGMENT WHICH IS SUSPECTED TO EXIST BUT HAS NOT BEEN DETECTED AND THEREFORE SHOWN AS AN ASSUMED ROUTE. **(NO DETECTION POSSIBLE)**
	QL-B3	POSITION OF THE UTILITY DETECTED BY ONE OF THE GEOPHYSICAL TECHNIQUES. **(EML OR GPR DETECTION WITH LIMITED CONFIDENCE IN DEPTH)**
	QL-B2	POSITION AND DEPTH OF THE UTILITY DETECTED BY ONE OF THE GEOPHYSICAL TECHNIQUES. **(EML OR GPR DETECTION WITH CONFIDENCE IN DEPTH)**
	QL-B1	POSITION AND DEPTH OF THE UTILITY DETECTED BY MULTIPLE GEOPHYSICAL TECHNIQUES. **(EML + GPR DETECTION)**

DISCLAIMER

Whilst every effort has been taken in the preparation of this drawing, the original land marks/apparatus configuration may have been altered since the survey/drawing was produced. The user shall make further enquiries and investigations to satisfy himself as to the accuracy of this drawing and position of the apparatus. The exact positions of the apparatus should be verified by the use of suitable detection devices and safe digging practices in accordance with HSG47, further advice on the location of apparatus should be recommended by the owner. No representation is made by Greenhatch Group, its agents or servants as to the accuracy, completeness, and sufficiency or otherwise of this drawing and the position of the apparatus.

All apparatus shall be treated as live unless proved otherwise by the owner. It is the users responsibility to ensure that the information on the location of apparatus is provided to all persons (either direct labour or contractors) working in proximity to the apparatus.

Rev	Date	Description	Drawn	Q. Ref.

greenhatch group

Topographical Surveys
Site Engineering
Utility / CCTV Surveys
Measured Building Surveys
3D Laser Scanning
Revit & BIM Models

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NW1 5LL
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CLIENT

Robert Woodhead Ltd

PROJECT

Oxcroft & Mill Lane
Bolsover
S44 6DJ

TITLE

Utility Survey

SCALE	DATE
A0@ 1: 500	**22/04/2020**
DRAWN	QUALITY REF
MAB/AS/MA	**GH7159**

Level datum	See note
Grid orientation	See note
Job number	36335

Drawing No.	Rev.
36335_T_UG	*0*

Comments

This plan should only be used for its original purpose. Greenhatch Group accepts no responsibility for this plan if supplied to any party other than the original client.

All dimensions should be checked on site prior to design and construction.

Drainage information (where applicable) has been visually inspected from the surface and therefore should be treated as approximate only.

Notes:

Appendix B

NOTES

GENERAL NOTES

Not for construction. Please check dimensions on site. All topographical information by others. Exact site boundaries and lease agreements TBC by clients solicitor with reference to title deeds.

Demolition works subject to S.Eng appraisal. Refer to recommendations in asbestos register and refer to current asbestos reports. Specialist asbestos removal contractor to be used prior to demolition works.

All layouts as illustrated are subject to designs and surveys by others.

LEGEND

Refer to house type plans for info

- Type 1 - 2B4P
- Type 2 - 2B4P
- Type 3/3A - 3B5P
- Type 4 - 4B7P
- Type 5/5A - 2B3P
- Type 6 - 3B6P tbc

MILL LANE - UNIT SCHEDULE

00 no. 2Bed Type 1
03 no. 2Bed Type 2
05 no. 3Bed Type 3
02 no. 3Bed Type 3A
03 no. 4Bed Type 4
03 no. 2Bed Type 5
06 no. 2Bed Type 5A
10 no. 3Bed Type 6

TOTAL UNITS - 32
TOTAL BEDS - 87

Legal Info

1. ©RDA Consultant Architects. Drawing not for construction. Do not scale from this drawing in either paper or digital form. Use written dimensions only. All dimensions are given in millimeters unless otherwise stated.
2. All survey information by others. Check all dimensions on site. Site boundaries to be confirmed by client solicitors with reference to title deeds.
3. This drawing is intended for use by the commissioning client only. RDA do not assume any liability to any third party for the information herein.

REVISIONS

WORK IN PROGRESS

JOB TITLE
Fountain Gardens Mill Lane Bolsover

DWG TITLE
Proposed Site Layout Plan

DATE	BY	CHECKED BY	
31/03/21	JSB	CJG	A2

DWG NO.	REV.	STATUS
2747(08)G01	D	Preliminary

RaynerDaviesArchitects
Nottingham | Kent
2 St. Peter's Gate
Nottingham
NG1 2JG
01159473859
www.rd-architects.co.uk

00 | MILL LANE - Proposed Plan | 1:500

Appendix C

enzygo
environmental consultants

Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

Notes:

- Do not scale from this drawing.
- All dimensions are in meters unless stated otherwise.
- This drawing is to be read in conjunction with all relevant drawings and documents associated with this project.
- All existing and proposed dimensions, levels and locations to be checked and verified by the main contractor on site prior to the commencement of the works and any anomalies reported to the engineer.

SCALE	PROJECT NO.	PROJECT
NTS / A3	MAN.1788.001	Oxcroft and Mill Lane, Bolsover
DATE	DRAWING NO.	DRAWING TITLE
April 2020	MAN.1788.001.GE.D.002	Proposed Location Plan
DRAWN	CHECKED	CLIENT
MG	GP	Dragonfly Developments Ltd

EXPLORATORY HOLE LOG KEY

Logging

The logging of soils and rocks has been carried out in accordance with BS 5930:2015 unless stated otherwise.

Well/Backfill

 Granular response zone

 Bentonite seal

 Cement/ bentonite grout

 Soil Backfill

 Concrete

Water Levels

▽ Strike depth ▼ Standing water

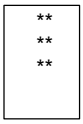
Sample type

D Small disturbed sample	G Gas	U Undisturbed	P Piston
B Bulk disturbed sample	ES Soil sample for environmental testing	UT Undisturbed thin wall	W Water
LB Large bulk disturbed	EW Water sample for environmental testing	C Core	

Test type

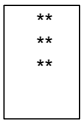
N SPT/CPT N value
HV Hand vane - direct reading in kPa
PP Pocket penetrometer - direct reading in kg/sq.cm

Core



TCR Total Core Recovery as percentage of core run
SCR Solid Core Recovery as percentage of core run. Assessment of core is based on full diameter
RQD Rock Quality Designation - Amount of solid core greater than 100mm expressed as percentage of core run

I_f



Minimum fracture spacing value (cm)
Mode fracture spacing value (cm)
Maximum fracture spacing value (cm)

Strata boundaries

——————— Boundary – – – – – – – – – – – – Estimated boundary

General Comments

Enzygo Ltd
Tel: 01454 269237
Fax: 01454 269760
Web: www.enzygo.com

Site
Oxcroft and Mill Lane, Bolsover

SA06

Job No	Dates	Ground Level (m)	Co-Ordinates
MAN.1788.001	Start 28-04-20 Finish 28-04-20		

Client
Dragonfly Developments limited

Sheet
1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
				0.10			MADE GROUND: Tarmac.
	0.30	1ES		0.35			MADE GROUND: Yellowish brown sandy angular and subangular fine to coarse limestone and brick GRAVEL.
	0.50	2ES 3B					MADE GROUND: Dark brown ashy gravelly fine to coarse SAND with frequent glass, plastic and metal fragments. Gravel is angular and subangular fine to coarse brick, slate, concrete and tarmac.
				0.90			Yellowish brown and orangish brown slightly clayey fine and medium SAND.
	1.50	4D		1.60			Yellowish brown and orangish brown slightly clayey gravelly fine and medium SAND. Gravel is angular and subangular fine to coarse limestone.
				2.00			Trial Pit completed at 2.00m.
				{4.00}			

0 1 2 3 4

General Remarks

Dimensions: 1.50x0.70x2.00
1. Trial pit excavated by JCB 3CX Mechanical excavator.
2. Trial pit sides remained stable and vertical.
3. Groundwater not encountered.
4. Soakaway test undertaken at 2.00m begl.
5. No visual or olfactory evidence of contamination encountered.
6. On completion, the trial pit was backfilled with material arisings.

All dimensions in metres
Scale 1:25

Logged By
DC

Enzygo Ltd
Tel: 01454 269237
Fax: 01454 269760
Web: www.enzygo.com

Site: Oxcroft and Mill Lane, Bolsover

SA07

Job No	Dates	Ground Level (m)	Co-Ordinates
MAN.1788.001	Start 27-04-20 Finish 28-04-20		

Client: Dragonfly Developments limited

Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
	0.20	1ES		0.15			MADE GROUND: Tarmac.
				0.50			Yellowish brown and orangish brown slightly clayey sandy angular and subangular fine to coarse limestone GRAVEL with a high limestone cobble content.
	0.60	2D					Yellowish brown and orangish brown gravelly fine to coarse SAND. Gravel is angular and subangular fine to coarse limestone with a high limestone cobble content.
	1.60	3D					
				2.00			Trial Pit completed at 2.00m.
				{4.00}			

0 1 2 3 4

General Remarks

Dimensions: 1.60x0.70x2.00
1. Trial pit excavated by JCB 3CX Mechanical excavator.
2. Trial pit sides remained stable and vertical.
3. Groundwater not encountered.
4. Soakaway test undertaken at 2.00m begl.
5. No visual or olfactory evidence of contamination encountered.
6. On completion, the trial pit was backfilled with material arisings.

All dimensions in metres
Scale 1:25

Logged By: DC

Enzygo Ltd
Tel: 01454 269237
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Web: www.enzygo.com

Site: Oxcroft and Mill Lane, Bolsover

SA08

Job No	Dates	Ground Level (m)	Co-Ordinates
MAN.1788.001	Start 27-04-20 Finish 27-04-20		

Client: Dragonfly Developments limited

Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
	0.15	1ES		0.10			MADE GROUND: Tarmac.
				0.25			MADE GROUND: Grey sandy angular and subangular fine to coarse granite GRAVEL. (Type 1)
	0.50	2B					MADE GROUND: Yellowish brown sandy angular and subangular fine to coarse limestone GRAVEL.
				0.80			MADE GROUND: Dark brown ashy slightly clayey gravelly fine to coarse SAND with frequent glass, plastic, wood and metal fragments. Gravel is angular and subangular fine to coarse brick, concrete, tarmac and slate.
	1.00	3ES					
	2.00	4ES					
				2.90			MADE GROUND: Orangish brown slightly clayey gravelly fine to coarse SAND with frequent ceramic and glass fragments. Gravel is angular and subangular fine to coarse brick and limestone with a high brick cobble content.
	3.00	5ES					
				3.80			Trial Pit completed at 3.80m.
				{4.00}			

0 1 2 3 4

General Remarks

Dimensions: 1.80x0.70x3.80
1. Trial pit excavated by JCB 3CX Mechanical excavator.
2. Trial pit sides remained stable and vertical.
3. Groundwater not encountered.
4. Soakaway test could not be undertaken due to the depth of Made Ground.
5. No visual or olfactory evidence of contamination encountered.
6. On completion, the trial pit was backfilled with material arisings.

All dimensions in metres
Scale 1:25

Logged By: DC

Enzygo Ltd
Tel: 01454 269237
Fax: 01454 269760
Web: www.enzygo.com

Site: Oxcroft and Mill Lane, Bolsover

SA09

Job No	Dates	Ground Level (m)	Co-Ordinates
MAN.1788.001	Start 27-04-20 Finish 27-04-20		

Client: Dragonfly Developments limited

Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
				0.10			MADE GROUND: Tarmac.
	0.30	1ES					MADE GROUND: Grey sandy angular and subangular fine to coarse granite GRAVEL. (Type 1)
	0.50	2B					
				0.80			MADE GROUND: Dark brown ashy slightly clayey gravelly fine to coarse SAND with frequent glass, plastic, wood and metal fragments. Gravel is angular and subangular fine to coarse brick, limestone, concrete, tarmac and slate with a high concrete and limestone cobble content.
	1.50	3ES					
	2.40	4ES		2.40			Trial Pit completed at 2.40m.
				{4.00}			

0 1 2 3 4

General Remarks

Dimensions: 1.80x0.70x2.40
1. Trial pit excavated by JCB 3CX Mechanical excavator.
2. Trial pit sides remained stable and vertical.
3. Groundwater not encountered.
4. Soakaway test could not be undertaken due to the depth of Made Ground.
5. No visual or olfactory evidence of contamination encountered.
6. On completion, the trial pit was backfilled with material arisings.

All dimensions in metres
Scale 1:25

Logged By: DC

Enzygo Ltd
Tel: 01454 269237
Fax: 01454 269760
Web: www.enzygo.com

Site: Oxcroft and Mill Lane, Bolsover

SA10

Job No	Dates	Ground Level (m)	Co-Ordinates
MAN.1788.001	Start 28-04-20 Finish 28-04-20		

Client: Dragonfly Developments limited

Sheet: 1 of 1

Water Levels	Samples & In Situ Testing: Depth (m)	No/Type	Results	Depth (m)	Level (mAD)	Legend	Stratum Description
				0.10			MADE GROUND: Grass over soft dark brown slightly gravelly sandy CLAY with frequent roots and rootlets (up to 1mm diam.). Gravel is angular to subrounded fine to coarse limestone and quartzite. (Topsoil)
	0.50	1ES					MADE GROUND: Dark brown ashy slightly clayey gravelly fine to coarse SAND with frequent glass, plastic, wood, ceramic and metal fragments. Gravel is angular and subangular fine to coarse brick, concrete, tarmac, coal, limestone and slate.
	1.50	2ES					
	2.50	3ES		2.50			Trial Pit completed at 2.50m.
				{4.00}			

0 1 2 3 4

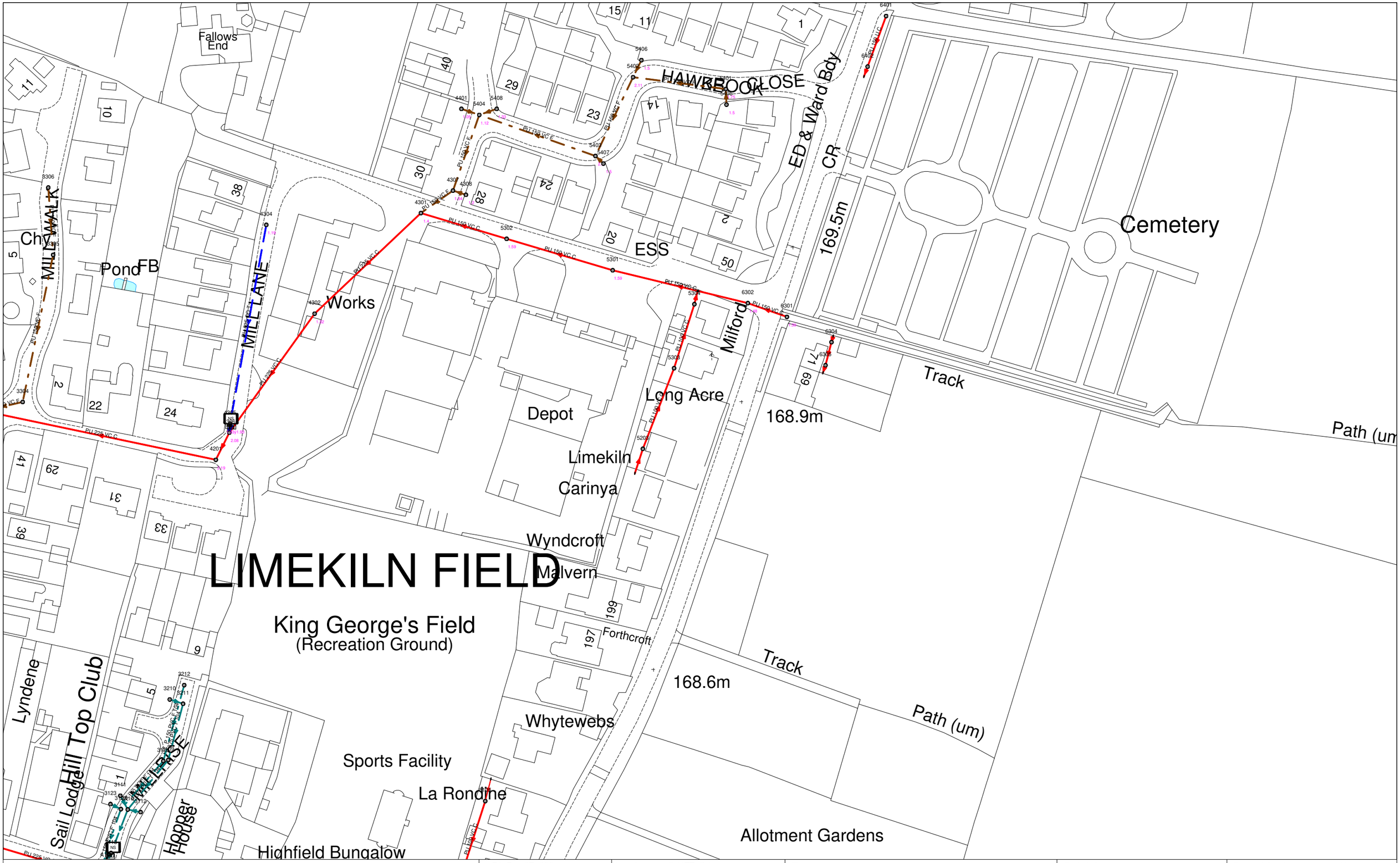
General Remarks

Dimensions: 1.80x0.70x2.50
1. Trial pit excavated by JCB 3CX Mechanical excavator.
2. Trial pit sides remained stable and vertical.
3. Groundwater not encountered.
4. Soakaway test could not be undertaken due to the depth of Made Ground.
5. No visual or olfactory evidence of contamination encountered.
6. On completion, the trial pit was backfilled with material arisings.

All dimensions in metres
Scale 1:25

Logged By: DC

Appendix D



447417 : 371202	Map Name : SK4771SW	Title	Partial Key
	Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : YorMap Advisor C ROBERTS Contact Tel : 87 2582	Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS
		(Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2014. All rights reserved Ordnance Survey Licence number 100022432	This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.
			Date Req : 29/04/2020, 15:42:11 — Date Gen : 29/04/2020, 15:42:22
			Source : Sewer Network Enquiry

UPN: Undefined Originator: C ROBERTS, YorMap, 87 2582

YorkshireWater

Mr R Somal
Dice Consulting Engineers Ltd
16 Commerce Square
Nottingham
NG1 1HS

info@diceconsult.co.uk
0115 952 8752

Yorkshire Water Services
Developer Services
Sewerage Technical Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax: (01274) 372 834

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

Your Ref: n/a
Our Ref: W005147

29th April 2020

Dear Mr Somal,,

Mill Lane, Bolsover, S44 6NP - Pre-Planning Enquiry - T806795 - Residential

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months.

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul Water

Foul water domestic waste can discharge to the 150 mm diameter public foul/combined sewer recorded in Mill Lane, at a point north of the site.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SuDS), for example the use of soakaways and/or permeable hardstanding etc, may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SuDS in this instance from the appropriate authorities.

If other methods of surface water disposal are not viable and subject to providing satisfactory evidence as to why they have been discounted, curtilage surface water discharges to the public sewer will be restricted to the level of run-off - i.e. same rate of discharge - to that from the existing use of the site less a 30% reduction in the existing discharge. Any discharge of surface water from the site should discharge to similar points of connection to that of the existing use of the site. You will need to demonstrate positive drainage, based on a 1 in 1 year storm, to the public sewer to Yorkshire Water by means of investigation and calculation carried out at your expense.

To do this, Yorkshire Water requires to see existing and proposed drainage layouts with pipe sizes, gradients, gullies, downpipes and connection points, measured impermeable areas of the present and proposed use of the site, along with the calculations that show the existing and proposed discharge rate from the site to the public sewer.

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Developer Services Team (telephone 0345 120 84 82) for further information.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

Chris Roberts
Pre-Development Technician
Developer Services
Yorkshire Water Services Limited

Appendix E

enzygo
environmental consultants

Samuel House, 5 Fox Valley Way, Stocksbridge, Sheffield, S36 2AA

Notes:

- Do not scale from this drawing.
- All dimensions are in meters unless stated otherwise.
- This drawing is to be read in conjunction with all relevant drawings and documents associated with this project.
- All existing and proposed dimensions, levels and locations to be checked and verified by the main contractor on site prior to the commencement of the works and any anomalies reported to the engineer.

SCALE	PROJECT NO.	PROJECT
NTS / A3	MAN.1788.001	Oxcroft and Mill Lane, Bolsover
DATE	DRAWING NO.	DRAWING TITLE
April 2020	MAN.1788.001.GE.D.002	Proposed Location Plan
DRAWN	CHECKED	CLIENT
MG	GP	Dragonfly Developments Ltd

	Site:	**Mill Ln and Oxcroft Ln, Bolsover**
	Job Number :	**MAN.1788.001**
	Date:	**24/04/2020**

SOIL INFILTRATION RATE TEST
BRE Digest 365, DG365, February 2016

Soakaway Number.....	SA1	
Pit Length.....	1.90	m
Pit Width.....	0.70	m
Pit Depth.....	2.00	m
Gravel Void Ratio……	1.00	

(Gravel used = 0.30, No Gravel = 1.00)

Remarks: -

Encountered Geology

Refer to SA1 Log for encountered ground condition.

Groundwater

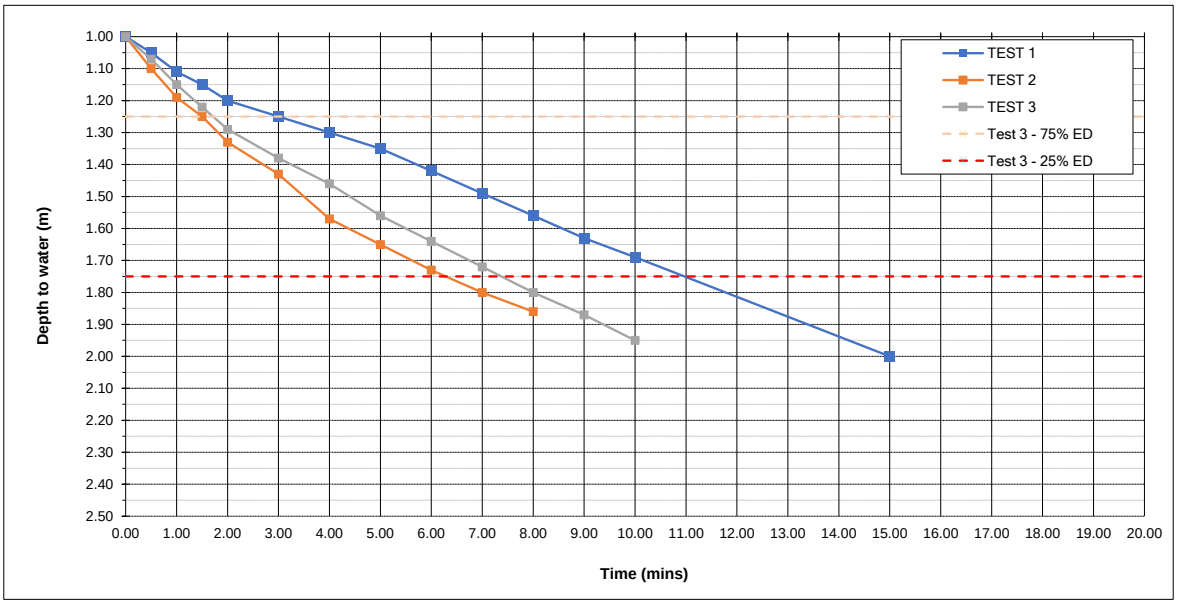
None encountered

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	1.00	0.00	1.00	0.00	1.00
0.50	1.05	0.50	1.10	0.50	1.07
1.00	1.11	1.00	1.19	1.00	1.15
1.50	1.15	1.50	1.25	1.50	1.22
2.00	1.20	2.00	1.33	2.00	1.29
3.00	1.25	3.00	1.43	3.00	1.38
4.00	1.30	4.00	1.57	4.00	1.46
5.00	1.35	5.00	1.65	5.00	1.56
6.00	1.42	6.00	1.73	6.00	1.64
7.00	1.49	7.00	1.80	7.00	1.72
8.00	1.56	8.00	1.86	8.00	1.80
9.00	1.63			9.00	1.87
10.00	1.69			10.00	1.95
15.00	2.00				

Effective Depth	m	1.00	1.00	1.00
75% Effective Depth	m	0.75	0.75	0.75
(i.e. depth below GL)	m	**1.25**	**1.25**	**1.25**
50% Effective depth	m	0.50	0.50	0.50
(i.e. depth below GL)	m	**1.50**	**1.50**	**1.50**
25% Effective Depth	m	0.25	0.25	0.25
(i.e. depth below GL)	m	**1.75**	**1.75**	**1.75**
Effective Storage Depth 75%-25%	m	0.50	0.50	0.50
Time to fall to 75% effective depth	mins	3.00	1.50	1.72
Time to fall to 25% effective depth	mins	11.00	6.28	7.37
Vp (75%-25%)	m^3	0.67	0.67	0.67
ap50 (50%)	m^2	3.93	3.93	3.93
tp(75%-25%)	mins	8.00	4.78	5.65
SOIL INFILTRATION RATE	m/s	**3.5E-04**	**5.9E-04**	**5.0E-04**

DESIGN SOIL INFILTRATION RATE, f m/s **3.53E-04**

SA1



Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site:	**Mill Ln and Oxcroft Ln, Bolsover**
	Job Number :	**MAN.1788.001**
	Date:	**24/04/2020**

SOIL INFILTRATION RATE TEST
BRE Digest 365, DG365, February 2016

Soakaway Number.....	SA2	
Pit Length.....	1.60	m
Pit Width.....	0.70	m
Pit Depth.....	1.90	m
Gravel Void Ratio.....	1.00	

(Gravel used = 0.30, No Gravel = 1.00)

Remarks: -

Encountered Geology

Refer to SA2 Log for encountered ground condition.

Groundwater

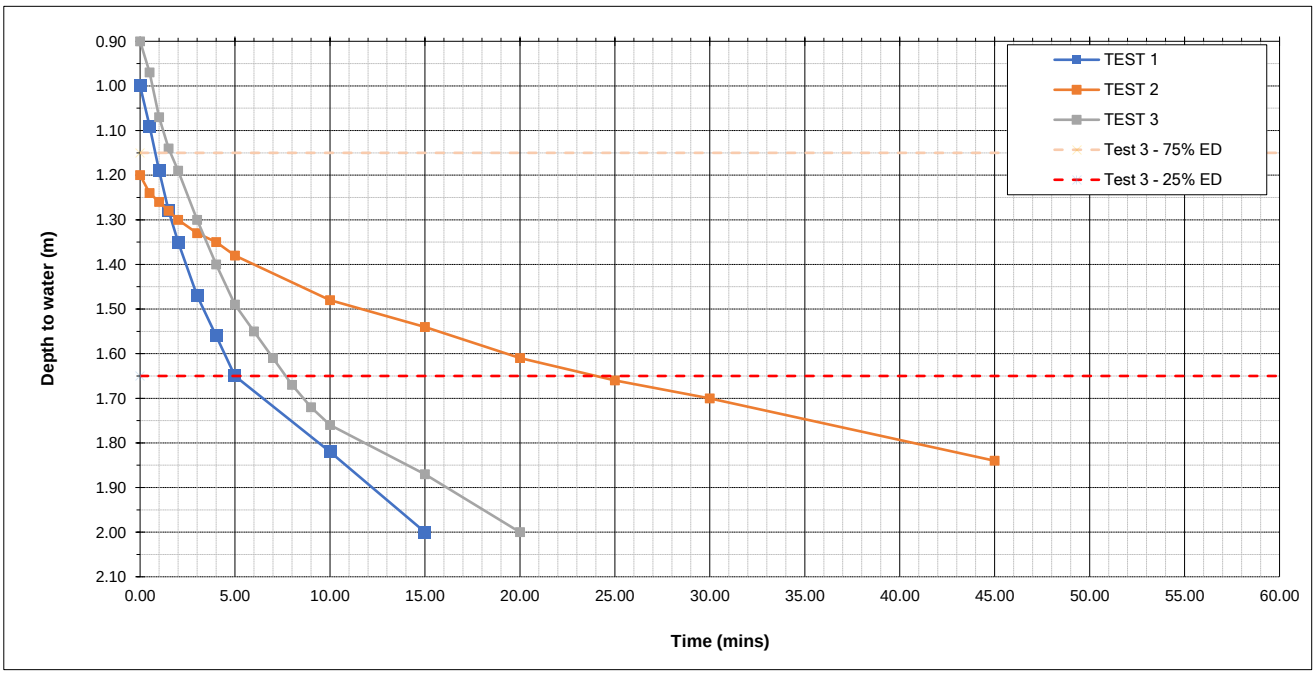
None encountered

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	1.00	0.00	1.20	0.00	0.90
0.50	1.09	0.50	1.24	0.50	0.97
1.00	1.19	1.00	1.26	1.00	1.07
1.50	1.28	1.50	1.28	1.50	1.14
2.00	1.35	2.00	1.30	2.00	1.19
3.00	1.47	3.00	1.33	3.00	1.30
4.00	1.56	4.00	1.35	4.00	1.40
5.00	1.65	5.00	1.38	5.00	1.49
10.00	1.82	10.00	1.48	6.00	1.55
15.00	2.00	15.00	1.54	7.00	1.61
		20.00	1.61	8.00	1.67
		25.00	1.66	9.00	1.72
		30.00	1.70	10.00	1.76
		45.00	1.84	15.00	1.87
				20.00	2.00

		TEST 1	TEST 2	TEST 3
Effective Depth	m	0.90	0.70	1.00
75% Effective Depth	m	0.68	0.53	0.75
(i.e. depth below GL)	m	**1.23**	**1.38**	**1.15**
50% Effective depth	m	0.45	0.35	0.50
(i.e. depth below GL)	m	**1.45**	**1.55**	**1.40**
25% Effective Depth	m	0.23	0.18	0.25
(i.e. depth below GL)	m	**1.68**	**1.73**	**1.65**
Effective Storage Depth 75%-25%	m	0.45	0.35	0.50
Time to fall to 75% effective depth	mins	1.22	5.00	1.60
Time to fall to 25% effective depth	mins	5.88	33.20	7.66
Vp (75%-25%)	m^3	0.50	0.39	0.56
ap50 (50%)	m^2	3.19	2.73	3.42
tp(75%-25%)	mins	4.66	28.20	6.06
SOIL INFILTRATION RATE	m/s	**5.7E-04**	**8.5E-05**	**4.5E-04**

DESIGN SOIL INFILTRATION RATE, f m/s **8.49E-05**

SA2



Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site: Mill Ln and Oxcroft Ln, Bolsover	Soakaway Number..... SA3
	Job Number : MAN.1788.001	Pit Length..... 1.70 m
	Date: 28/04/2020	Pit Width..... 0.70 m
		Pit Depth..... 1.70 m
	SOIL INFILTRATION RATE TEST	Gravel Void Ratio..... 1.00
	BRE Digest 365, DG365, February 2016	***(Gravel used = 0.30, No Gravel = 1.00)***

Remarks: -

Encountered Geology

Refer to SA3 Log for encountered ground condition.

Groundwater

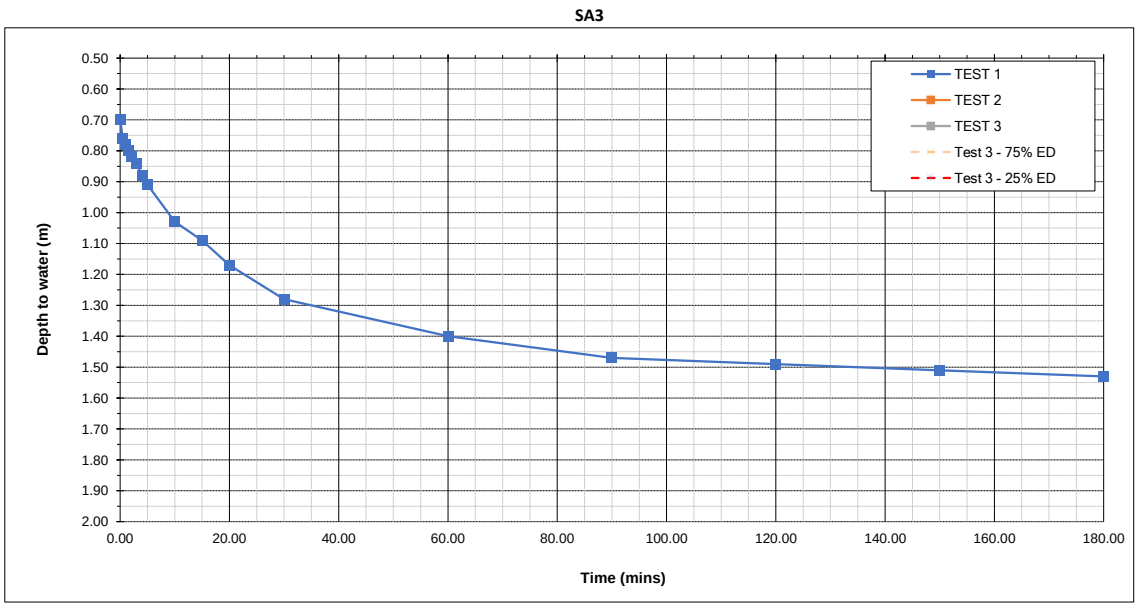
None encountered

Testing

Full three cycles of testing were unable to be completed in accoardance with BRE365 due to time constraints.

	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.00	0.70				
	0.50	0.76				
	1.00	0.78				
	1.50	0.80				
	2.00	0.82				
	3.00	0.84				
	4.00	0.88				
	5.00	0.91				
	10.00	1.03				
	15.00	1.09				
	20.00	1.17				
	30.00	1.28				
	60.00	1.40				
	90.00	1.47				
	120.00	1.49				
	150.00	1.51				
	180.00	1.53				
Effective Depth	m	1.00				
75% Effective Depth	m	0.75				
(i.e. depth below GL)	m	**0.95**				
50% Effective depth	m	0.50				
(i.e. depth below GL)	m	**1.20**				
25% Effective Depth	m	0.25				
(i.e. depth below GL)	m	**1.45**				
Effective Storage Depth 75%-25%	m	0.50				
Time to fall to 75% effective depth	mins	6.66				
Time to fall to 25% effective depth	mins	81.40				
Vp (75%-25%)	m^3	0.60				
ap50 (50%)	m^2	3.59				
tp(75%-25%)	mins	74.74				
SOIL INFILTRATION RATE	m/s	**3.7E-05**				

DESIGN SOIL INFILTRATION RATE, f m/s **3.70E-05**



Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site:	**Mill Ln and Oxcroft Ln, Bolsover**
	Job Number :	**MAN.1788.001**
	Date:	**27/04/2020 and 28/04/2020**

SOIL INFILTRATION RATE TEST
BRE Digest 365, DG365, February 2016

Soakaway Number.....	SA4	
Pit Length.....	1.60	m
Pit Width.....	0.65	m
Pit Depth.....	1.85	m
Gravel Void Ratio……	1.00	

(Gravel used = 0.30, No Gravel = 1.00)

Remarks: -

Encountered Geology
Refer to SA4 Log for encountered ground condition.

Groundwater
None encountered

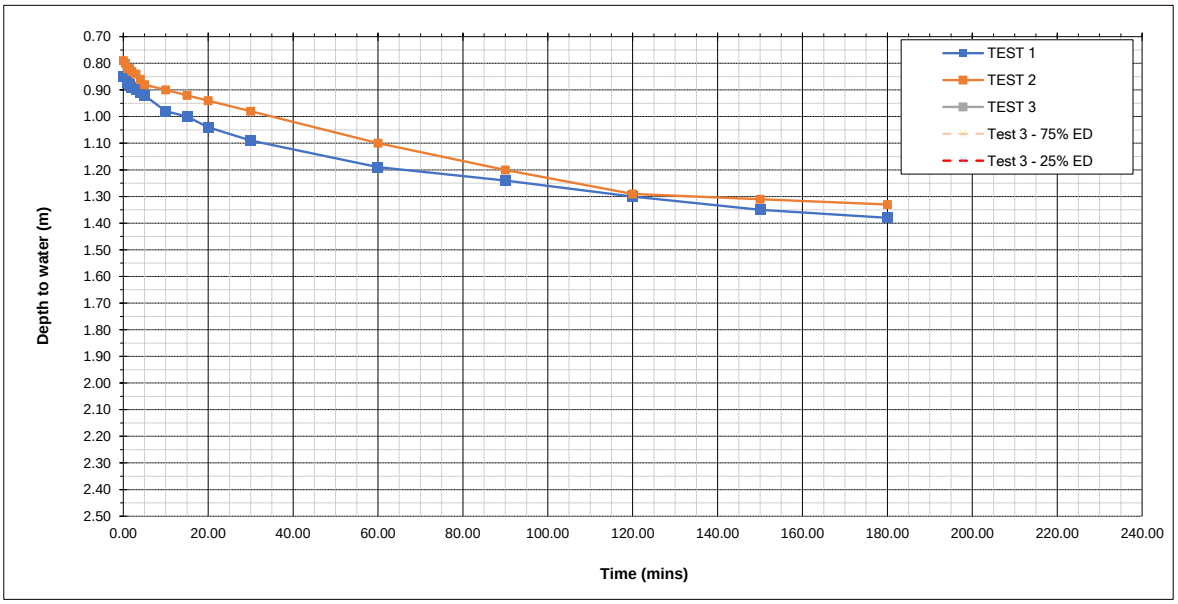
Testing
Full three cycles of testing were unable to be completed in accoardance with BRE365 due to time constraints.

	TEST 1		TEST 2		TEST 3	
	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
	0.00	0.85	0.00	0.79		
	0.50	0.85	0.50	0.80		
	1.00	0.87	1.00	0.82		
	1.50	0.88	1.50	0.82		
	2.00	0.89	2.00	0.83		
	3.00	0.90	3.00	0.84		
	4.00	0.91	4.00	0.86		
	5.00	0.92	5.00	0.88		
	10.00	0.98	10.00	0.90		
	15.00	1.00	15.00	0.92		
	20.00	1.04	20.00	0.94		
	30.00	1.09	30.00	0.98		
	60.00	1.19	60.00	1.10		
	90.00	1.24	90.00	1.20		
	120.00	1.30	120.00	1.29		
	150.00	1.35	150.00	1.31		
	180.00	1.38	180.00	1.33		

Effective Depth	m	1.00	1.06	
75% Effective Depth	m	0.75	0.80	
(i.e. depth below GL)	m	**1.10**	**1.06**	
50% Effective depth	m	0.50	0.53	
(i.e. depth below GL)	m	**1.35**	**1.32**	
25% Effective Depth	m	0.25	0.27	
(i.e. depth below GL)	m	**1.60**	**1.59**	
Effective Storage Depth 75%-25%	m	0.50	0.53	
Time to fall to 75% effective depth	mins	33.00	50.00	
Time to fall to 25% effective depth	mins	540.00	760.00	
Vp (75%-25%)	m^3	0.52	0.55	
ap50 (50%)	m^2	3.29	3.43	
tp(75%-25%)	mins	507.00	710.00	
SOIL INFILTRATION RATE	m/s	**5.2E-06** (extrapolated)	**3.8E-06** (extrapolated)	

DESIGN SOIL INFILTRATION RATE, f m/s **3.78E-06** (extrapolated)

SA4



Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site:	**Mill Ln and Oxcroft Ln, Bolsover**
	Job Number :	**MAN.1788.001**
	Date:	**24/04/2020**

SOIL INFILTRATION RATE TEST
BRE Digest 365, DG365, February 2016

Soakaway Number.....	SA5	
Pit Length.....	1.80	m
Pit Width.....	0.70	m
Pit Depth.....	2.00	m
Gravel Void Ratio.....	1.00	

(Gravel used = 0.30, No Gravel = 1.00)

Remarks: -

Encountered Geology

Refer to SA5 Log for encountered ground condition.

Groundwater

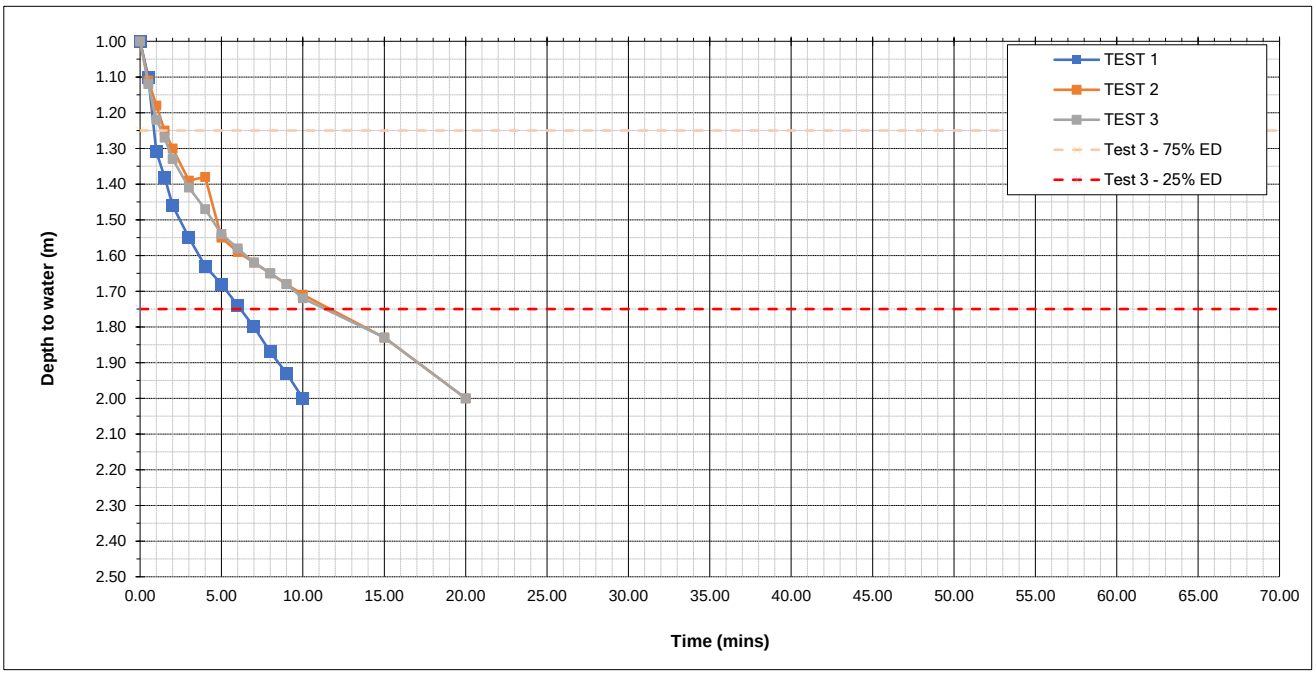
None encountered

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	1.00	0.00	1.00	0.00	1.00
0.50	1.10	0.50	1.11	0.50	1.12
1.00	1.31	1.00	1.18	1.00	1.22
1.50	1.38	1.50	1.25	1.50	1.27
2.00	1.46	2.00	1.30	2.00	1.33
3.00	1.55	3.00	1.39	3.00	1.41
4.00	1.63	4.00	1.38	4.00	1.47
5.00	1.68	5.00	1.55	5.00	1.54
6.00	1.74	6.00	1.59	6.00	1.58
7.00	1.80	7.00	1.62	7.00	1.62
8.00	1.87	8.00	1.65	8.00	1.65
9.00	1.93	9.00	1.68	9.00	1.68
10.00	2.00	10.00	1.71	10.00	1.72
		15.00	1.83	15.00	1.83
		20.00	2.00	20.00	2.00

Effective Depth	m	1.00	1.00	1.00
75% Effective Depth	m	0.75	0.75	0.75
(i.e. depth below GL)	m	**1.25**	**1.25**	**1.25**
50% Effective depth	m	0.50	0.50	0.50
(i.e. depth below GL)	m	**1.50**	**1.50**	**1.50**
25% Effective Depth	m	0.25	0.25	0.25
(i.e. depth below GL)	m	**1.75**	**1.75**	**1.75**
Effective Storage Depth 75%-25%	m	0.50	0.50	0.50
Time to fall to 75% effective depth	mins	0.85	1.50	1.30
Time to fall to 25% effective depth	mins	6.16	9.00	11.36
Vp (75%-25%)	m^3	0.63	0.63	0.63
ap50 (50%)	m^2	3.76	3.76	3.76
tp(75%-25%)	mins	5.31	7.50	10.06
SOIL INFILTRATION RATE	m/s	**5.3E-04**	**3.7E-04**	**2.8E-04**

DESIGN SOIL INFILTRATION RATE, f m/s **2.78E-04**

SA5



Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site: Mill Ln and Oxcroft Ln, Bolsover	Soakaway Number..... SA6
	Job Number : MAN.1788.001	Pit Length..... 1.50 m
	Date: 28/04/2020	Pit Width..... 0.70 m
		Pit Depth..... 2.00 m
	SOIL INFILTRATION RATE TEST	Gravel Void Ratio..... 1.00
	BRE Digest 365, DG365, February 2016	***(Gravel used = 0.30, No Gravel = 1.00)***

Remarks: -

Encountered Geology

Refer to SA6 Log for encountered ground condition.

Groundwater

None encountered

Testing

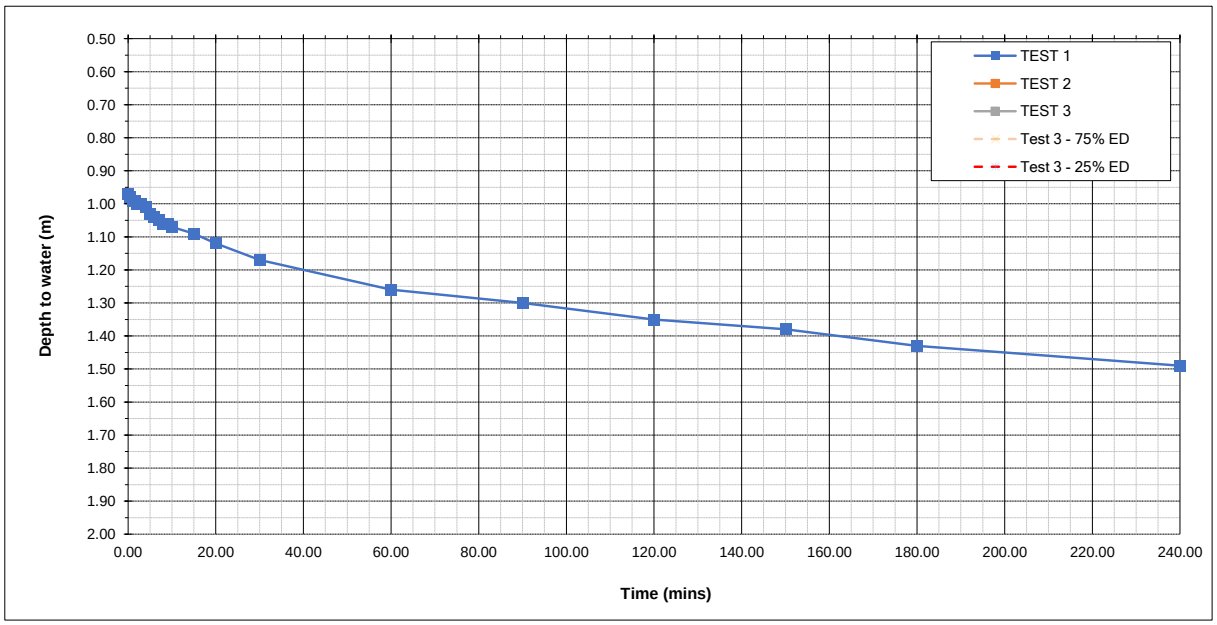
Full three cycles of testing were unable to be completed in accoardance with BRE365 due to time constraints.

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	0.97				
0.50	0.98				
1.00	0.99				
1.50	0.99				
2.00	1.00				
3.00	1.00				
4.00	1.01				
5.00	1.03				
6.00	1.04				
7.00	1.05				
8.00	1.06				
9.00	1.06				
10.00	1.07				
15.00	1.09				
20.00	1.12				
30.00	1.17				
60.00	1.26				
90.00	1.30				
120.00	1.35				
150.00	1.38				
180.00	1.43				
240.00	1.49				

Effective Depth	m	1.03		
75% Effective Depth	m	0.77		
(i.e. depth below GL)	m	**1.23**		
50% Effective depth	m	0.52		
(i.e. depth below GL)	m	**1.49**		
25% Effective Depth	m	0.26		
(i.e. depth below GL)	m	**1.74**		
Effective Storage Depth 75%-25%	m	0.52		
Time to fall to 75% effective depth	mins	50.00		
Time to fall to 25% effective depth	mins	850.00		
Vp (75%-25%)	m^3	0.54		
ap50 (50%)	m^2	3.32		
tp(75%-25%)	mins	800.00		
SOIL INFILTRATION RATE	m/s	**3.4E-06** (extrapolated)		

DESIGN SOIL INFILTRATION RATE, f m/s **3.40E-06** (extrapolated)

SA6



Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site:	**Mill Ln and Oxcroft Ln, Bolsover**
	Job Number :	**MAN.1788.001**
	Date:	**27/04/2020 and 28/04/2020**

SOIL INFILTRATION RATE TEST
BRE Digest 365, DG365, February 2016

Soakaway Number.....	SA7	
Pit Length.....	1.60	m
Pit Width.....	0.70	m
Pit Depth.....	2.00	m
Gravel Void Ratio.....	1.00	

(Gravel used = 0.30, No Gravel = 1.00)

Remarks: -

Encountered Geology
Refer to SA7 Log for encountered ground condition.

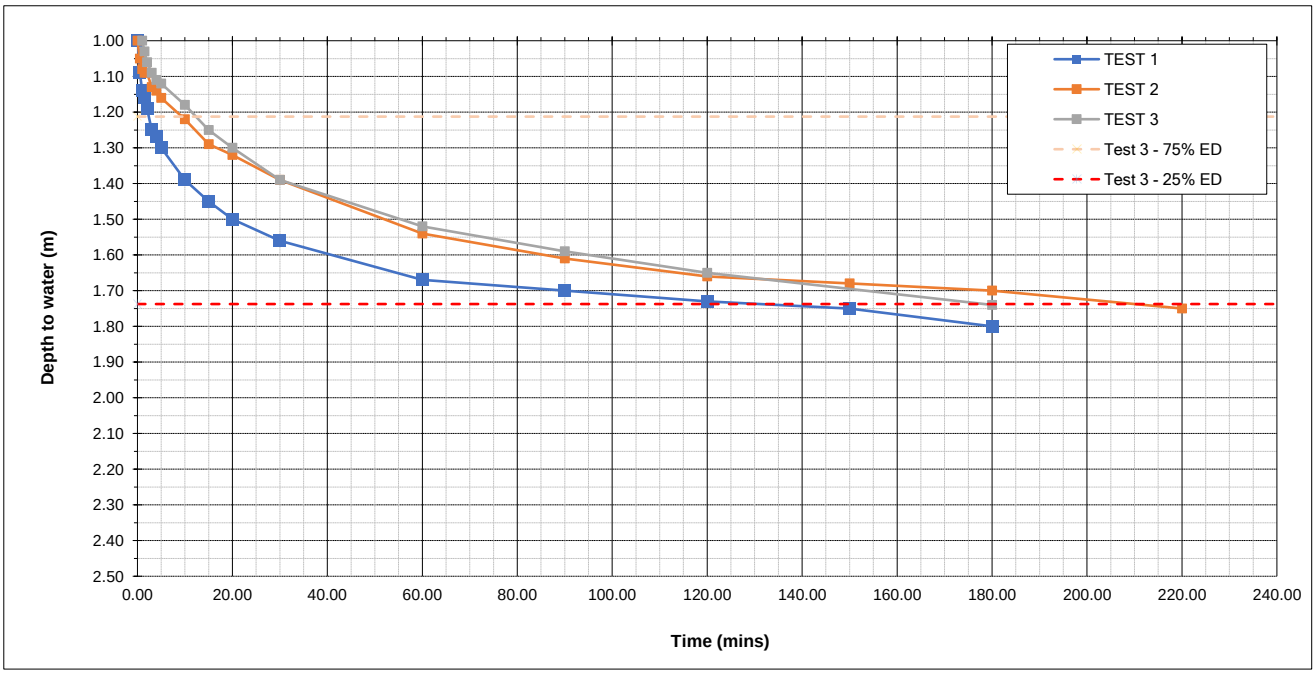
Groundwater
None encountered

TEST 1		TEST 2		TEST 3	
Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)	Time(min)	Depth to Water (m)
0.00	1.00	0.00	1.00	0.00	0.95
0.50	1.09	0.50	1.05	0.50	0.97
1.00	1.14	1.00	1.08	1.00	1.00
1.50	1.16	1.50	1.09	1.50	1.03
2.00	1.19	2.00	1.09	2.00	1.06
3.00	1.25	3.00	1.13	3.00	1.09
4.00	1.27	4.00	1.14	4.00	1.11
5.00	1.30	5.00	1.16	5.00	1.12
10.00	1.39	10.00	1.22	10.00	1.18
15.00	1.45	15.00	1.29	15.00	1.25
20.00	1.50	20.00	1.32	20.00	1.30
30.00	1.56	30.00	1.39	30.00	1.39
60.00	1.67	60.00	1.54	60.00	1.52
90.00	1.70	90.00	1.61	90.00	1.59
120.00	1.73	120.00	1.66	120.00	1.65
150.00	1.75	150.00	1.68	180.00	1.74
180.00	1.80	180.00	1.70		
		220.00	1.75		

Effective Depth	m	1.00	1.00	1.05
75% Effective Depth	m	0.75	0.75	0.79
(i.e. depth below GL)	m	**1.25**	**1.25**	**1.21**
50% Effective depth	m	0.50	0.50	0.53
(i.e. depth below GL)	m	**1.50**	**1.50**	**1.48**
25% Effective Depth	m	0.25	0.25	0.26
(i.e. depth below GL)	m	**1.75**	**1.75**	**1.74**
Effective Storage Depth 75%-25%	m	0.50	0.50	0.53
Time to fall to 75% effective depth	mins	3.00	12.14	12.14
Time to fall to 25% effective depth	mins	150.00	220.00	180.00
Vp (75%-25%)	m^3	0.56	0.56	0.59
ap50 (50%)	m^2	3.42	3.42	3.54
tp(75%-25%)	mins	147.00	207.86	167.86
SOIL INFILTRATION RATE	m/s	**1.9E-05**	**1.3E-05**	**1.7E-05**

DESIGN SOIL INFILTRATION RATE, f m/s **1.31E-05**

SA7



Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site: Mill Ln and Oxcroft Ln, Bolsover **Job Number :** MAN.1788.001 **Date:** 27/04/2020	Soakaway Number..... SA8 Pit Length..... 1.80 m Pit Width..... 0.70 m Pit Depth..... 3.80 m

Remarks: -

Encountered Geology

Refer to SA8 Log for encountered ground condition.

Groundwater

None encountered

Testing

Tests were not undertaken within trial pit due to encountering deep made ground to base of trial pit at 3.80m below ground level.

Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site: Mill Ln and Oxcroft Ln, Bolsover **Job Number :** MAN.1788.001 **Date:** 27/04/2020	Soakaway Number..... SA9 Pit Length..... 1.80 m Pit Width..... 0.70 m Pit Depth..... 2.40 m

Remarks: -

Encountered Geology

Refer to SA9 Log for encountered ground condition.

Groundwater

None encountered

Testing

Tests were not undertaken within trial pit due to encountering deep made ground to base of trial pit at 2.40m below ground level.

Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020

	Site: Mill Ln and Oxcroft Ln, Bolsover **Job Number :** MAN.1788.001 **Date:** 28/04/2020	Soakaway Number..... SA10 Pit Length..... 1.80 m Pit Width..... 0.70 m Pit Depth..... 2.50 m

Remarks: -

Encountered Geology

Refer to SA10 Log for encountered ground condition.

Groundwater

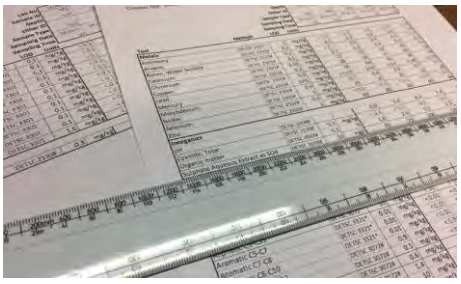
None encountered

Testing

Tests were not undertaken within trial pit due to encountering deep made ground to base of trial pit at 2.50m below ground level.

Compiled By:	Date:	Approved By:	Date
G.Parr	04.05.2020	D.Frayne	04.05.2020





Phase 2: Site Investigation

Mill Lane, Bolsover

WM Saunders

S191022

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1 EXECUTIVE SUMMARY

Site Address	Mill Lane, Bolsover
Proposed Development	The site is outlined for a residential development.
Fieldwork	• 6no small percussive boreholes (BH1 to BH6) drilled to a maximum of 3.70mbgl with 4no. monitoring pipes in BH1, BH3, BH4 and BH6. • 10no machine excavated trial pits (TP1 to TP10) to a maximum depth of 3.70mbgl.
Ground Conditions	• Made ground was encountered to depths of between 0.75mbgl and 3.40mbgl. Not penetrated within TP2, TP3, TP5, TP7, TP8 or TP9 • Drift deposits localised to BH1 and TP1 comprised firm consistency sandy gravelly clay from 2.20mgl. • Rockhead of weathered limestone encountered in nine of sixteen positions, between 0.75 and 3.60mbgl. • Groundwater was noted encountered.
Contamination Testing Results	• Ten made ground samples tested, four of these also tested for leachates. • Elevated lead, arsenic PAHs and TPH locally. • Within leachates, one exceedance noted for sulphates. • No asbestos fibres. • Slightly acidic to alkaline pH.
Contamination Analysis	• Given the site's proposed residential land use, the levels of contamination recorded on site may pose a risk to the current and future users of the site. • If any zones of odorous, brightly coloured or suspected contaminated ground or groundwater are encountered then work should cease in that area until the material has been investigated. The results of the investigation will therefore determine whether or not remediation will be required. • Made ground classed as contaminated (lead, arsenic, TPH and PAHs) with respect to construction workers. PPE for workers. Damping down of site during dry windy conditions. • Clean cover system required for all proposed areas of soft landscaping, to 0.60m based on guidance from YALPAG. • Controlled waters unlikely to be at risk. • With respect to utilities pH was elevated; as a minimum all services should be laid in clean trenches. • Sub surface concrete should be designed to DS-3 ACEC (Class AC-2s). This assumes static groundwater conditions.
Geotechnical Testing Results	• Made ground deposits loose based on in-situ SPTs. • Cohesive deposits medium strength based on in-situ SPTs. • Cohesive materials on site have a medium volume change potential. • Moisture contents between 7.8 and 53%. • Sulphates between 65-559mg/l, pH slightly alkaline. • 3no. soakaway tests each within TP4 and TP10 returned infiltration rates of between 5.49 and 14.2 x 10^{-6} m/sec for both tests
Geotechnical Analysis & Foundation Recommendations	• Consideration to be given to strips upon cohesive deposits, piled foundations, raft foundations or strips upon bedrock • Bearing capacity of 100kN/m^2 at minimum depth of 2.20mbgl on 0.60m wide strips upon cohesive deposits in the northwest of the site. • For piles or mini-piles, further boreholes may be needed and this information should be provided to a competent piling contractor. • Bearing capacity of 250kN/m^2 at minimum depth of 0.75mbgl on 0.60m wide strips upon limestone rockhead in the east of the site. • Normal earthworks plant for excavations.

Appendix F

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 448000 371400 SK 48000 71400
Data Type	Catchment
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.427	4-8	0.178

Total Area Contributing (ha) = 0.605

Total Pipe Volume (m^3) = 12.535

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

Network Design Table for Surface Network 1

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	8.762	0.150	58.4	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit	
1.001	2.698	0.100	27.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.002	10.476	0.250	41.9	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
1.003	32.969	0.350	94.2	0.045	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.004	6.551	0.304	21.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	18.068	0.106	170.0	0.068	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	44.056	0.881	50.0	0.170	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.006	32.584	0.192	169.7	0.154	0.00	0.0	0.600	o	375	Pipe/Conduit	
3.000	8.023	0.201	39.9	0.106	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	11.945	0.299	40.0	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.007	9.771	0.058	168.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.008	19.561	0.115	170.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.009	7.739	0.170	45.5	0.050	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.14	166.000	0.000	0.0	0.0	0.0	1.01	7.9	0.0
1.001	50.00	5.17	165.850	0.000	0.0	0.0	0.0	1.49	11.7	0.0
1.002	50.00	5.32	165.750	0.000	0.0	0.0	0.0	1.19	9.4	0.0
1.003	50.00	5.85	165.500	0.045	0.0	0.0	0.0	1.04	18.3	6.1
1.004	50.00	5.90	165.150	0.045	0.0	0.0	0.0	2.18	38.5	6.1
1.005	50.00	6.20	164.771	0.113	0.0	0.0	0.0	1.00	39.8	15.3
2.000	50.00	5.40	165.545	0.170	0.0	0.0	0.0	1.85	73.7	23.0
1.006	50.00	6.59	164.664	0.436	0.0	0.0	0.0	1.39	153.3	59.1
3.000	50.00	5.06	164.972	0.106	0.0	0.0	0.0	2.08	82.6	14.4
3.001	50.00	5.16	164.771	0.119	0.0	0.0	0.0	2.07	82.5	16.1
1.007	50.00	6.70	164.473	0.555	0.0	0.0	0.0	1.56	248.7	75.2
1.008	50.00	6.91	164.415	0.555	0.0	0.0	0.0	1.56	247.5	75.2
1.009	50.00	6.99	164.300	0.605	0.0	0.0	0.0	1.50	26.4«	81.9

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	100	PS3	166.850	166.000	0.750	Open Manhole	450
1.001	o	100	PS4	166.850	165.850	0.900	Open Manhole	450
1.002	o	100	PS5	166.850	165.750	1.000	Open Manhole	450
1.003	o	150	PS1	166.850	165.500	1.200	Open Manhole	1200
1.004	o	150	PS2	167.500	165.150	2.200	Open Manhole	450
1.005	o	225	S10	167.168	164.771	2.172	Open Manhole	1200
2.000	o	225	S1	168.142	165.545	2.372	Open Manhole	1200
1.006	o	375	S2	166.402	164.664	1.363	Open Manhole	1200
3.000	o	225	S8	166.658	164.972	1.461	Open Manhole	1200
3.001	o	225	S9	166.835	164.771	1.839	Open Manhole	1200
1.007	o	450	S3	166.718	164.473	1.795	Open Manhole	1200
1.008	o	450	S5	166.642	164.415	1.777	Open Manhole	1200
1.009	o	150	S6	165.900	164.300	1.450	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	8.762	58.4	PS4	166.850	165.850	0.900	Open Manhole	450
1.001	2.698	27.0	PS5	166.850	165.750	1.000	Open Manhole	450
1.002	10.476	41.9	PS1	166.850	165.500	1.250	Open Manhole	1200
1.003	32.969	94.2	PS2	167.500	165.150	2.200	Open Manhole	450
1.004	6.551	21.5	S10	167.168	164.846	2.172	Open Manhole	1200
1.005	18.068	170.0	S2	166.402	164.664	1.513	Open Manhole	1200
2.000	44.056	50.0	S2	166.402	164.664	1.513	Open Manhole	1200
1.006	32.584	169.7	S3	166.718	164.472	1.871	Open Manhole	1200
3.000	8.023	39.9	S9	166.835	164.771	1.839	Open Manhole	1200
3.001	11.945	40.0	S3	166.718	164.473	2.020	Open Manhole	1200
1.007	9.771	168.5	S5	166.642	164.415	1.777	Open Manhole	1200
1.008	19.561	170.1	S6	165.900	164.300	1.150	Open Manhole	1200
1.009	7.739	45.5	S7	165.616	164.130	1.336	Open Manhole	1500

Network Classifications for Surface Network 1

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
1.000	PS3	100	0.750	0.900	Unclassified	450	0	0.750	Unclassified
1.001	PS4	100	0.900	1.000	Unclassified	450	0	0.900	Unclassified
1.002	PS5	100	1.000	1.250	Unclassified	450	0	1.000	Unclassified
1.003	PS1	150	1.200	2.200	Unclassified	1200	0	1.200	Unclassified
1.004	PS2	150	2.172	2.200	Unclassified	450	0	2.200	Unclassified
1.005	S10	225	1.513	2.172	Unclassified	1200	0	2.172	Unclassified
2.000	S1	225	1.513	2.372	Unclassified	1200	0	2.372	Unclassified
1.006	S2	375	1.363	1.871	Unclassified	1200	0	1.363	Unclassified
3.000	S8	225	1.461	1.839	Unclassified	1200	0	1.461	Unclassified
3.001	S9	225	1.839	2.020	Unclassified	1200	0	1.839	Unclassified
1.007	S3	450	1.777	1.795	Unclassified	1200	0	1.795	Unclassified
1.008	S5	450	1.150	1.777	Unclassified	1200	0	1.777	Unclassified
1.009	S6	150	1.336	1.450	Unclassified	1200	0	1.450	Unclassified

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009	S7	165.616	164.130	0.000	1500	0

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 448000 371400 SK 48000 71400
Data Type	Catchment
Summer Storms	Yes
Winter Storms	No

Synthetic Rainfall Details

Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S6, DS/PN: 1.009, Volume (m³): 4.7

Unit Reference	MD-SHE-0140-1050-1600-1050
Design Head (m)	1.600
Design Flow (l/s)	10.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	140
Invert Level (m)	164.300
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	10.5	Kick-Flo®	0.985	8.4
Flush-Flo™	0.466	10.5	Mean Flow over Head Range	-	9.2

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0	1.200	9.2	3.000	14.1	7.000	21.2
0.200	9.3	1.400	9.9	3.500	15.2	7.500	21.9
0.300	10.1	1.600	10.5	4.000	16.2	8.000	22.6
0.400	10.4	1.800	11.1	4.500	17.2	8.500	23.3
0.500	10.5	2.000	11.7	5.000	18.0	9.000	23.9
0.600	10.4	2.200	12.2	5.500	18.9	9.500	24.5
0.800	9.8	2.400	12.7	6.000	19.7		
1.000	8.4	2.600	13.2	6.500	20.5		

Storage Structures for Surface Network 1

Tank or Pond Manhole: S6, DS/PN: 1.009

Invert Level (m) 164.300

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	58.1	0.500	124.7	1.000	216.4	1.500	333.2
0.100	69.4	0.600	141.0	1.100	237.7	1.600	359.6
0.200	81.7	0.700	158.3	1.200	260.1		
0.300	95.0	0.800	176.7	1.300	283.5		
0.400	109.3	0.900	196.0	1.400	307.8		

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	PS3	0.135	0.000	0.135
1.001	PS4	0.159	0.000	0.159
1.002	PS5	0.175	0.000	0.175
1.003	PS1	1.527	0.000	1.527
1.004	PS2	0.374	0.000	0.374
1.005	S10	2.711	0.000	2.711
2.000	S1	2.937	0.000	2.937
1.006	S2	1.966	0.000	1.966
3.000	S8	1.907	0.000	1.907
3.001	S9	2.335	0.000	2.335
1.007	S3	2.539	0.000	2.539
1.008	S5	2.519	0.000	2.519
1.009	S6	1.810	299.825	301.635
Total		21.093	299.825	320.918

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	PS3	0.135	0.000	0.135
1.001	PS4	0.159	0.000	0.159
1.002	PS5	0.175	0.000	0.175
1.003	PS1	1.527	0.000	1.527
1.004	PS2	0.374	0.000	0.374
1.005	S10	2.711	0.000	2.711
2.000	S1	2.937	0.000	2.937
1.006	S2	1.966	0.000	1.966
3.000	S8	1.907	0.000	1.907
3.001	S9	2.335	0.000	2.335
1.007	S3	2.539	0.000	2.539
1.008	S5	2.519	0.000	2.519
1.009	S6	1.810	299.825	301.635
Total		21.093	299.825	320.918

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 448000 371400 SK 48000 71400
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	PS3	15 Summer	2	+0%	100/15 Summer	100/15 Winter			166.000
1.001	PS4	15 Summer	2	+0%	100/15 Summer	100/15 Summer			165.850
1.002	PS5	15 Summer	2	+0%	100/15 Summer	100/15 Summer			165.750
1.003	PS1	15 Winter	2	+0%	100/15 Summer	100/15 Summer			165.561
1.004	PS2	15 Winter	2	+0%	30/15 Summer				165.193
1.005	S10	15 Winter	2	+0%	30/15 Summer				164.879
2.000	S1	15 Winter	2	+0%	30/15 Winter	100/15 Winter			165.642
1.006	S2	15 Winter	2	+0%	30/15 Summer				164.841
3.000	S8	15 Winter	2	+0%	30/60 Winter				165.051
3.001	S9	15 Winter	2	+0%	30/15 Summer				164.849
1.007	S3	120 Winter	2	+0%	30/15 Summer				164.773
1.008	S5	120 Winter	2	+0%	30/15 Summer				164.770

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	PS3	-0.100	0.000	0.00			0.0	OK	1
1.001	PS4	-0.100	0.000	0.00			0.0	OK	1
1.002	PS5	-0.100	0.000	0.00			0.0	OK	2
1.003	PS1	-0.089	0.000	0.34			5.9	OK	3
1.004	PS2	-0.107	0.000	0.18			6.0	OK	
1.005	S10	-0.117	0.000	0.42			14.8	OK	
2.000	S1	-0.129	0.000	0.37			26.1	OK	1
1.006	S2	-0.198	0.000	0.45			61.0	OK	
3.000	S8	-0.146	0.000	0.26			16.6	OK	
3.001	S9	-0.147	0.000	0.26			18.1	OK	
1.007	S3	-0.150	0.000	0.17			28.2	OK	
1.008	S5	-0.095	0.000	0.14			27.3	OK	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.009	S6	120 Winter	2	+0%	2/15 Summer				164.766

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.009	S6	0.316	0.000	0.46			10.5	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 448000 371400 SK 48000 71400
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	PS3	15 Summer	30	+0%	100/15 Summer	100/15 Winter			166.000
1.001	PS4	15 Summer	30	+0%	100/15 Summer	100/15 Summer			165.850
1.002	PS5	15 Summer	30	+0%	100/15 Summer	100/15 Summer			165.750
1.003	PS1	15 Winter	30	+0%	100/15 Summer	100/15 Summer			165.639
1.004	PS2	15 Winter	30	+0%	30/15 Summer				165.378
1.005	S10	15 Winter	30	+0%	30/15 Summer				165.320
2.000	S1	15 Winter	30	+0%	30/15 Winter	100/15 Winter			165.803
1.006	S2	120 Winter	30	+0%	30/15 Summer				165.302
3.000	S8	120 Winter	30	+0%	30/60 Winter				165.302
3.001	S9	120 Winter	30	+0%	30/15 Summer				165.300
1.007	S3	120 Winter	30	+0%	30/15 Summer				165.297
1.008	S5	120 Winter	30	+0%	30/15 Summer				165.295

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	PS3	-0.100	0.000	0.00			0.0	OK	1
1.001	PS4	-0.100	0.000	0.00			0.0	OK	1
1.002	PS5	-0.100	0.000	0.00			0.0	OK	2
1.003	PS1	-0.011	0.000	0.96			16.9	OK	3
1.004	PS2	0.078	0.000	0.49			15.8	SURCHARGED	
1.005	S10	0.324	0.000	1.07			38.3	SURCHARGED	
2.000	S1	0.033	0.000	0.83			58.6	SURCHARGED	1
1.006	S2	0.263	0.000	0.35			47.6	SURCHARGED	
3.000	S8	0.105	0.000	0.19			12.0	SURCHARGED	
3.001	S9	0.304	0.000	0.18			12.6	SURCHARGED	
1.007	S3	0.374	0.000	0.35			58.7	SURCHARGED	
1.008	S5	0.430	0.000	0.30			57.9	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.009	S6	120 Winter	30	+0%	2/15 Summer				165.291

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.009	S6	0.841	0.000	0.46			10.5	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	0.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 448000 371400 SK 48000 71400
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	PS3	15 Winter	100	+40%	100/15 Summer	100/15 Winter			166.850
1.001	PS4	15 Winter	100	+40%	100/15 Summer	100/15 Summer			166.850
1.002	PS5	15 Winter	100	+40%	100/15 Summer	100/15 Summer			166.850
1.003	PS1	15 Winter	100	+40%	100/15 Summer	100/15 Summer			166.851
1.004	PS2	15 Winter	100	+40%	30/15 Summer				166.640
1.005	S10	15 Winter	100	+40%	30/15 Summer				166.581
2.000	S1	15 Winter	100	+40%	30/15 Winter	100/15 Winter			168.143
1.006	S2	15 Winter	100	+40%	30/15 Summer				166.333
3.000	S8	15 Winter	100	+40%	30/60 Winter				166.208
3.001	S9	15 Winter	100	+40%	30/15 Summer				165.997
1.007	S3	240 Winter	100	+40%	30/15 Summer				165.900
1.008	S5	240 Winter	100	+40%	30/15 Summer				165.898

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	PS3	0.750	0.001	0.18			1.3	FLOOD	1
1.001	PS4	0.900	0.026	0.32			2.9	FLOOD	1
1.002	PS5	1.000	0.011	0.45			3.9	FLOOD	2
1.003	PS1	1.201	1.256	1.33			23.4	FLOOD	3
1.004	PS2	1.340	0.000	0.75			24.4	SURCHARGED	
1.005	S10	1.585	0.000	1.60			56.9	SURCHARGED	
2.000	S1	2.372	0.323	1.45			101.8	FLOOD	1
1.006	S2	1.294	0.000	1.84			250.9	FLOOD RISK	
3.000	S8	1.011	0.000	1.02			64.5	SURCHARGED	
3.001	S9	1.001	0.000	0.98			69.4	SURCHARGED	
1.007	S3	0.977	0.000	0.41			69.2	SURCHARGED	
1.008	S5	1.033	0.000	0.36			68.9	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.009	S6	240 Winter	100	+40%	2/15 Summer				165.894

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.009	S6	1.444	0.000	0.46			10.5	FLOOD RISK	

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 NOT TO BE USED FOR CONSTRUCTION.
5. SURFACE WATER ATTENUATION BASED ON 100 YEARS PLUS 40% CLIMATE CHANGE ALLOWANCE AND 0.605HA IMPERMEABLE AREA INCLUDING A 10% ALLOWANCE FOR URBAN CREEP.
6. PROPOSED SURFACE WATER DISCHARGE RATE OF 10.5L/S SUBJECT TO AGREEMENT WITH THE LEAD LOCAL FLOOD AUTHORITY, THE PLANNING AUTHORITY AND YORKSHIRE WATER.
7. PROPOSED DISCHARGE RATE BASED ON 30% BETTERMENT TO EXISTING BROWNFIELD RUN-OFF RATES CALCULATED USING THE MODIFIED RATIONAL METHOD AND 0.1541HA EXISTING IMPERMEABLE AREA DRAINING TO THE PUBLIC SEWERS WITHIN MILL LANE.
8. ANY CHANGES TO THE PROPOSED RUN-OFF RATES ON SITE WILL AFFECT THE FINAL DRAINAGE DESIGN AND ATTENUATION VOLUMES.
9. PROPOSED CONNECTION TO YORKSHIRE WATER PUBLIC SEWERS SUBJECT TO SECTION 106 AGREEMENT.
10. EXISTING INVERT LEVELS OF THE PUBLIC SEWERS OF POINTS OF CONNECTION INDICATIVE ONLY AND BASED ON GREENHATCH GROUP UTILITY SURVEY (REF. 36335_T_UG_REV. 0) INFORMATION. ANY CHANGES TO THESE SURVEY LEVELS MAY RESULT IN CHANGES TO THE PROPOSED DRAINAGE STRATEGY.

KEY

- ADOPTABLE SURFACE WATER PIPE
- ADOPTABLE SURFACE WATER MANHOLE
- ADOPTABLE SURFACE WATER FLOW CONTROL CHAMBER
- SURFACE WATER ATTENUATION BASIN
- ADOPTABLE FOUL WATER PIPE
- ADOPTABLE FOUL WATER MANHOLE
- PROPOSED HIGHWAY GULLY
- EXISTING YORKSHIRE WATER COMBINED SEWER
- EXISTING YORKSHIRE WATER PUBLIC SEWER EASEMENT
- ADOPTABLE YORKSHIRE WATER SEWER EASEMENT
- APPROXIMATE SITE OWNERSHIP BOUNDARY

SECTION 106 APPLICATIONS TO BE SOUGHT AND APPROVED PRIOR TO ANY CONSTRUCTION AND CONNECTIONS TO THE PUBLIC SEWER NETWORK BEING MADE.

FURTHER INVESTIGATION REQUIRED AT DETAILED DESIGN TO ESTABLISH EXISTING YORKSHIRE WATER COMBINED SEWER LOCATIONS AND INVERT LEVELS.

REV:	AMENDMENTS:	DRN:	CHK:	DATE:
P01	FIRST ISSUE	ME	RS	31.03.2021

Project:
MILL LANE
BOLSOVER

Drawing title:
PROPOSED DRAINAGE STRATEGY
SHEET 1 OF 1

Client:
WOODHEAD GROUP LTD.

Drawing number:
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Revision:	Sheet size:	Scale:
P01	A1	1:250
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