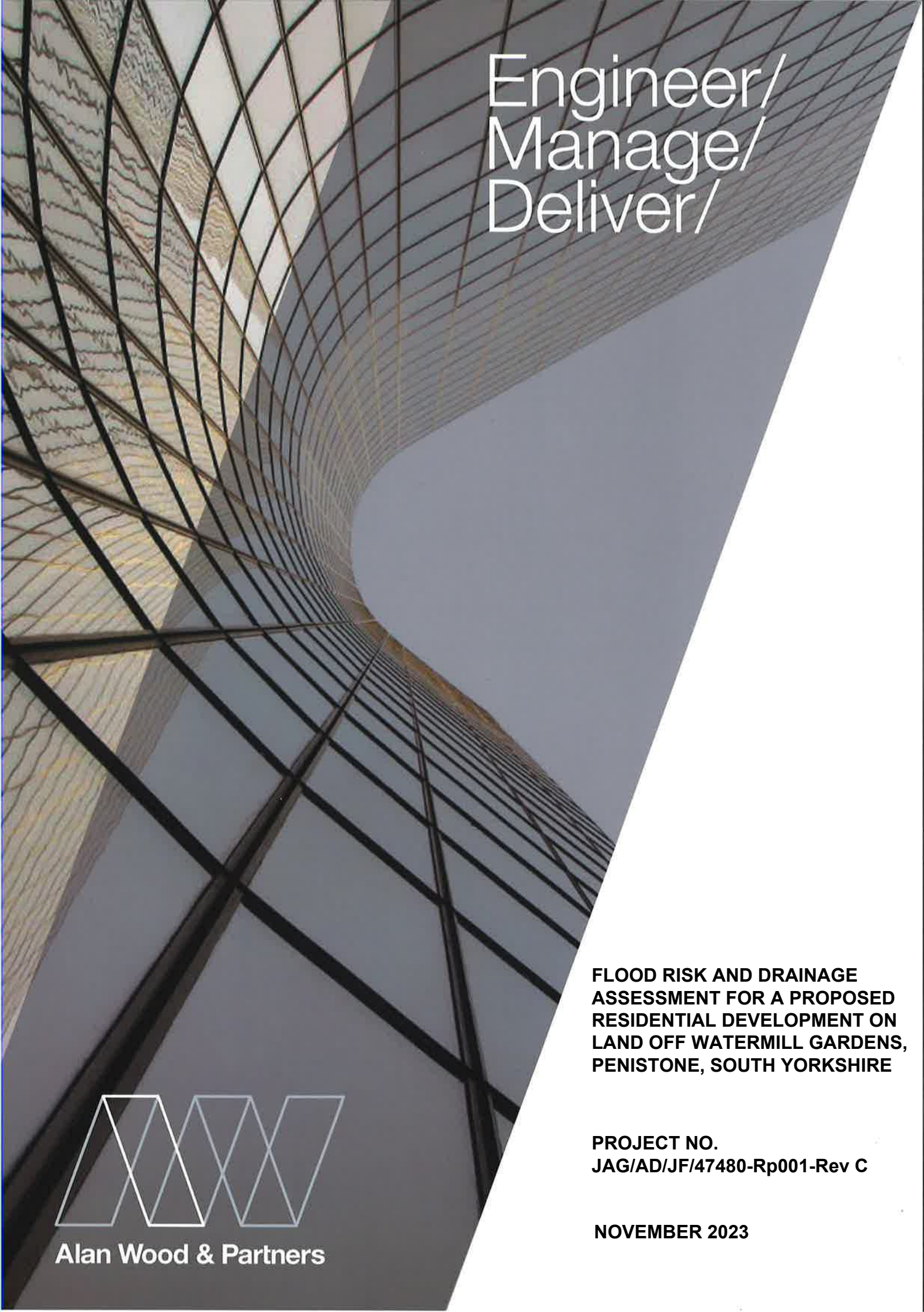

FLOOD RISK AND DRAINAGE ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT ON LAND OFF WATERMILL GARDENS, PENISTONE, SOUTH YORKSHIRE

PROJECT NO.
JAG/AD/JF/47480-Rp001-Rev C

NOVEMBER 2023

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Prepared by: A Dunn

Signed: ……
Date: 7th July 2023

Approved by: J Gibson, MEng (Hons), CEng, CWEM MCIWEM
Director

Signed: ……
Date: 7th July 2023

Issue	Revision	Revised by	Approved by	Revised Date
A	Site boundary amended/maps and drainage strategy drawing amended accordingly.	AD	JAG	09.08.23
B	Drainage drawing updated.	DC	JAG	05.09.23
C	Updated Site Boundary	TG	JAG	07.11.23

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APPENDICES

1.0 INTRODUCTION

1.1 Background

1.1.1 Alan Wood & Partners were commissioned by Mulgrave Property Group Ltd to prepare a Flood Risk and Drainage Assessment for a proposed residential development on land off Watermill Gardens, Penistone, South Yorkshire in support of a planning application.

1.1.2 A Flood Risk and Drainage Assessment (FRDA) for the proposed development is required to assess the development's risk from flooding and the suitability of the site in terms of drainage.

1.2 Layout of Report

1.2.1 Section 1 provides an introduction to the FRDA, explains the layout of this FRDA and provides an introduction to flood risk and the latest guidance on development and flood risk in England.

1.2.2 Section 2 provides an introduction to the site. The site description is based upon a desktop study and information provided by the developer. In order to obtain further information on flood risk, consultation was undertaken with the Environment Agency.

1.2.3 Section 3 of this report details the information gathered through the consultation.

1.2.4 Section 4 of this report details the development proposals and considers the development proposals in relation to the current planning policy on development and flood risk in England (and what type of development is considered appropriate in different flood risk zones). National Planning Policy Framework (NPPF): and its associated Technical Guidance (Communities and Local Government, July 2021) is the current planning policy on flood risk in England, and an introduction to NPPF is provided below.

1.2.5 Section 5 considers the foul water drainage arrangements for the proposed development.

1.2.6 Section 6 considers the surface water drainage arrangements for the proposed development.

1.2.7 Section 7 considers the operation and maintenance arrangements for the SuDS components of the proposed development.

1.2.8 Section 8 of this report considers the flood risk to site, and the potential for the development proposals to impact on flood risk. The assessment of flood risk is based on the latest planning policy and utilises all the information gathered in the preparation of the report.

1.2.9 Section 9 of this report provides details of any recommendations for further work to mitigate against possible flooding.

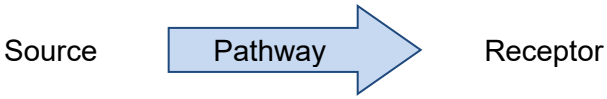
1.2.10 Section 10 of this report provides a summary of the report.

1.3 Flood Risk

1.3.1 Flood risk takes account of both the probability and the consequences of flooding.

1.3.2 Flood risk = probability of flooding x consequences of flooding

1.3.3 Probability is usually interpreted in terms of the return period, e.g. 1 in 100 and 1 in 200 year event, etc. In terms of probability, there is a 1 in 100 (1%) chance of one or more 1 in 100 year floods occurring in a given year. The consequences of flooding depends on how vulnerable a receptor is to flooding. The components of flood risk can be considered using a source-pathway-receptor model.



1.3.4 Sources constitute flood hazards, which are anything with the potential to cause harm through flooding (e.g. rainfall extreme sea levels, river flows and canals). Pathways represent the mechanism by which the flood hazard would cause harm to a receptor (e.g. overtopping and failure of embankments and flood defences, inadequate drainage and inundation of floodplains). Receptors comprise the people, property, infrastructure and ecosystems that could potentially be affected should a flood occur.

1.4 National Planning Policy Framework

1.4.1 General

1.4.1.1 NPPF and its associated Technical Guidance replaces Planning Policy Statement 25 and provides guidance on how to evaluate sites with respect to flood risk.

1.4.1.2 A summary of the requirements of the NPPF is provided below.

1.4.2 Sources of Flooding

1.4.2.1 The NPPF requires an assessment to flood risk to consider all forms of flooding and lists six forms of flooding that should be considered as part of a flood risk assessment. These forms of flooding are listed in Table 1, along with an explanation of each form of flooding.

Table 1: Forms of flooding

Flooding from Rivers (Fluvial Flooding)
Watercourses flood when the amount of water in them exceeds the flow capacity of the river channel. Flooding can either develop gradually or rapidly, depending on the characteristics of the catchment. Land use, topography and the development can have a strong influence on flooding from rivers.
Flooding from the Sea (Tidal Flooding)
Flooding to low-lying land from the sea and tidal estuaries is caused by storm surges and high tides. Where tidal defences exist, they can be overtopped or breached during a severe storm, which may be more likely with climate change.
Flooding from Land (Pluvial Flooding)
Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. In developed areas this flood water can be polluted with domestic sewage where foul sewers surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be taken into account in spatial planning for urban developments. Flooding can be exacerbated if development increases the percentage of impervious area.

Flooding from Groundwater
Groundwater flooding occurs when groundwater levels rise above ground levels (i.e. groundwater issues). Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). Chalk is the most extensive source of groundwater flooding.
Flooding from Sewers
In urban areas, rainwater is frequently drained into sewers. Flooding can occur when sewers are overwhelmed by heavy rainfall and become blocked. Sewer flooding continues until the water drains away.
Flooding from Other Artificial Sources (i.e. reservoirs, canals, lakes and ponds)
Non-natural or artificial sources of flooding can include reservoirs, canals and lakes. Reservoir or canal flooding may occur as a result of the facility being overwhelmed and /or as a result of dam or bank failure.

1.4.3 Flood Zones

1.4.3.1 For river and sea flooding, the NPPF uses four Flood Zones to characterise flood risk. These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences, and are detailed in Table 2.

Table 2: Flood zones

Flood Zone	Definition
1	Low probability (less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium probability (between 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year).
3a	High probability (1 in 100 or greater annual probability of river flooding (>1%) in any year or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).
3b	This zone comprises land where water has to flow or be stored in times flood. Land which would flood with an annual probability of 1 in 20 (5%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

1.4.4 Vulnerability

1.4.4.1 NPPF classifies the vulnerability of developments to flooding into five categories. These categories are detailed in Table 3.

Table 3: Flood risk vulnerability classification

Flood Risk Vulnerability Classification	Examples of Development Types
Essential Infrastructure	- Essential utility infrastructure including electricity generating power stations and grid and primary substations - Wind turbines
Highly Vulnerable	- Police stations, ambulance stations, fire stations, command centres and telecommunications installations required to be operational during flooding. - Emergency dispersal points. - Basement dwellings. - Caravans, mobile homes and park homes intended for permanent residential use.
More Vulnerable	- Hospitals. - Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non-residential uses for health services, nurseries and educational establishments. - Sites used for holiday or short-let caravans and camping.
Less Vulnerable	- Building used for shops, financial, professional and other services, restaurants and cafes, hot foot takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable" and assembly and leisure. - Land and buildings used for agriculture and forestry.
Water Compatible	- Docks, marinas and wharves. - Water based recreation (excluding sleeping accommodation). - Lifeguard and coastguard stations. - Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.

1.4.4.2 Based on the vulnerability of a development, NPPF states within what Flood Zones(s) the development is appropriate. The flood risk vulnerability and Flood Zone 'compatibility' of developments is summarised in Table 4.

Table 4: Flood risk vulnerability and flood zone compatibility

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test	✓	✓
	3a	Exception Test	✓	x	Exception Test	✓
	3b	Exception Test	✓	x	x	x

1.4.5 The Sequential Test, Exception Test and Sequential Approach

1.4.5.1 The Sequential Test is a risk-based test that should be applied at all stages of development and aims to steer new development to areas with the lowest probability of flooding (Zone 1). This is applied by the Local Planning Authority by means of a Strategic Flood Assessment (SFRA).

1.4.5.2 The SFRA and NPPF may require the Exception Test to be applied to certain forms of new development. The test considers the vulnerability of the new development to flood risk and, to be passed, must demonstrate that:

- There are sustainability benefits that outweigh the flood risk and;
- The new development is safe and does not increase flood risk elsewhere.

1.4.5.3 The Sequential Approach is also a risk-based approach to development. In a development site located in several Flood Zones or with other flood risk, the sequential approach directs the most vulnerable types of development towards areas of least risk within the site.

1.4.6 Climate Change

1.4.6.1 There is a planning requirement to account for climate change in the proposed design. The recommended allowances should be based on the most relevant guidance from the Environment Agency and the Lead Local Flood Authority.

1.4.7 Sustainable Drainage

1.4.7.1 The key planning objectives in NPPF are to appraise, manage and where possible, reduce flood risk. Sustainable Drainage Systems (SuDS) provide an effective way of achieving some of these objectives, and NPPF and Part H of the Building Regulations (2015 Edition) direct developers towards the use of SuDS wherever possible.

2.0 EXISTING SITE DESCRIPTION

2.1 Location

2.1.1 The site occupies land to the north of Watermill Gardens, to the north of the A628 (Barnsley Road) on the northern outskirts of Penistone, South Yorkshire.

2.1.2 An aerial photograph is included in Figure 1 below, which identifies the location of the site.

Figure 1: Aerial Photograph

2.1.3 The Ordnance Survey grid reference for the centre of the site development is approximately 424405, 403860.

2.2 Site Description

2.2.1 The application site currently comprises an area of grassland from a former playing field, extending to approximately 0.75ha in area.

2.3 Surrounding Features

2.3.1 To the north of the application site lies the grounds of Penistone Grammar School.

2.3.2 There is an area of open grassland to the north east of the site boundary which extends to a small open watercourse (Scout Dike).

2.3.3 There are a number of existing residential properties and site roadways to the south of the application site which comprised the initial phase of residential development. Beyond these properties lies the A628 (Barnsley Road) with the River Don lying immediately beyond the roadway.

2.3.4 The River Don is located approximately 100m to the south of the development.

2.3.5 Scout Dike is located approximately 200m to the north east of the development site.

2.4 Topography

2.4.1 A topographic survey of the development site has been undertaken, which shows that the existing ground levels over the area of the development vary from approximately 196.25m to 199.90m OD(N).

2.4.2 A copy of the topographic survey drawing is included in Appendix A.

2.5 Ground Conditions

2.5.1 Ground investigation works were undertaken for the initial phase of the development. The investigation showed that soakaways were not a viable option for the disposal of surface water run-off from the development.

2.5.2 Over the southern half of the development the mapping shows that there are superficial deposits of River Terrace Deposits – Sand and Gravel. There are no superficial deposits shown to exist over the northern half of the site.

2.5.3 The bedrock is shown to comprise Pennine Lower Coal Measures formation – Mudstone and Siltstone.

2.5.4 A study of the local groundwater maps show that the site overlays a Secondary A Aquifer and lies in an area where the groundwater vulnerability classification is ‘Medium’.

3.0 CONSULTATION

3.1 Consultation has taken place with the Design Team in order to obtain relevant information pertaining to the proposed development.

3.2 Consultation has taken place with the Environment Agency in order to obtain relevant information in respect of flood mapping, details of which are incorporated within this report.

3.3 Consultation has taken place with South Yorkshire County Council in respect of surface water drainage in their role as Lead Local Flood Authority in the region in respect of SuDS guidance.

3.4 Consultation has been undertaken with Yorkshire Water in respect of the disposal of foul water and surface water drainage from the development. Yorkshire Water have agreed to a surface water discharge rate of 3.5l/s into the system within Watermill Gardens. A copy of the correspondence received from Yorkshire Water is appended to this report within Appendix C.

4.0 PROPOSED DEVELOPMENT

4.1 The Development

4.1.1 The proposed development comprises the second phase residential development to include:-

- The construction of 17 residential dwellings
- Domestic garages
- Site access roads and footpaths
- Driveways
- Public open space
- Service installation works

4.1.2 A site layout drawing showing details of the proposed development is included in Appendix B.

4.2 Flood Risk

4.2.1 In terms of flood risk vulnerability, the construction of buildings for residential use is classed as 'More Vulnerable' development (Table 3).

4.2.2 In terms of flood zone compatibility, the construction of 'More Vulnerable' development is considered to be appropriate in Flood Zone 1 (Table 4).

5.0 FOUL WATER DRAINAGE

5.1 Design Criteria

5.1.1 Based upon a development comprising 17 dwellings and with a peak flow rate of 4000 litres per dwelling per day, in accordance with Sewerage Sector Guidance Appendix C – March 2020, the peak flow water flow from the development site would be 1 l/s.

5.2 Run-off Destination

5.2.1 It is proposed that foul water domestic waste from the development will be discharged to the public sewer network, for which formal approval will be required from Yorkshire Water Services.

5.2.2 Yorkshire Water have advised that the foul water domestic waste from the development can discharge to the 150 mm diameter public foul sewer recorded in Watermill Gardens, at a point to the south of the site.

5.2.3 A copy of the pre-planning response from Yorkshire Water is included in Appendix C.

5.3 Outfall

5.3.1 The preliminary design work undertaken has shown that a gravity connection to the public sewer should be achievable.

5.3.2 However, if it is found at the detailed design stage that a gravity connection cannot be achieved, then it will be necessary for a pumped outfall to be provided incorporating a pump station and rising main constructed to adoptable standards.

5.4 Drawing

5.4.1 A drawing showing the foul water drainage strategy for the development is included in Appendix E.

6.0 SURFACE WATER DRAINAGE

6.1 General

6.1.1 The surface water drainage has been designed in accordance with current CIRIA C753 SuDS Manual guidelines.

6.2 Existing Site

6.2.1 From the aerial photograph included in Figure 2 below, it can be seen that the area of the development comprises an area of open grassland, which will discharge to the ground at the local greenfield run-off rate.

Figure 2: Aerial Photograph

6.3 Run-off Destination

6.3.1 Requirement H3 of the Building Regulations establishes a preferred hierarchy for disposal of surface water. Consideration should firstly be given to soakaway, infiltration, watercourse and sewer in that priority order.

6.3.2 The local ground conditions are unsuitable for the use of soakaways as the means for disposal of the surface water run-off from the development (See Section 2.5).

6.3.3 The second preferred option would be to discharge the surface water run-off from the development to a watercourse.

6.3.4 A study of the local region shows that the River Don lies approximately 90m to the south of the application site and Scout Dike lies approximately 90m to the north east of the site.

6.3.5 However, access to these watercourses cannot be gained without crossing third party land which is outside the control of the developer.

6.3.6 It is therefore proposed that the surface water run-off from the development is discharged to the public sewer network within watermill garden.

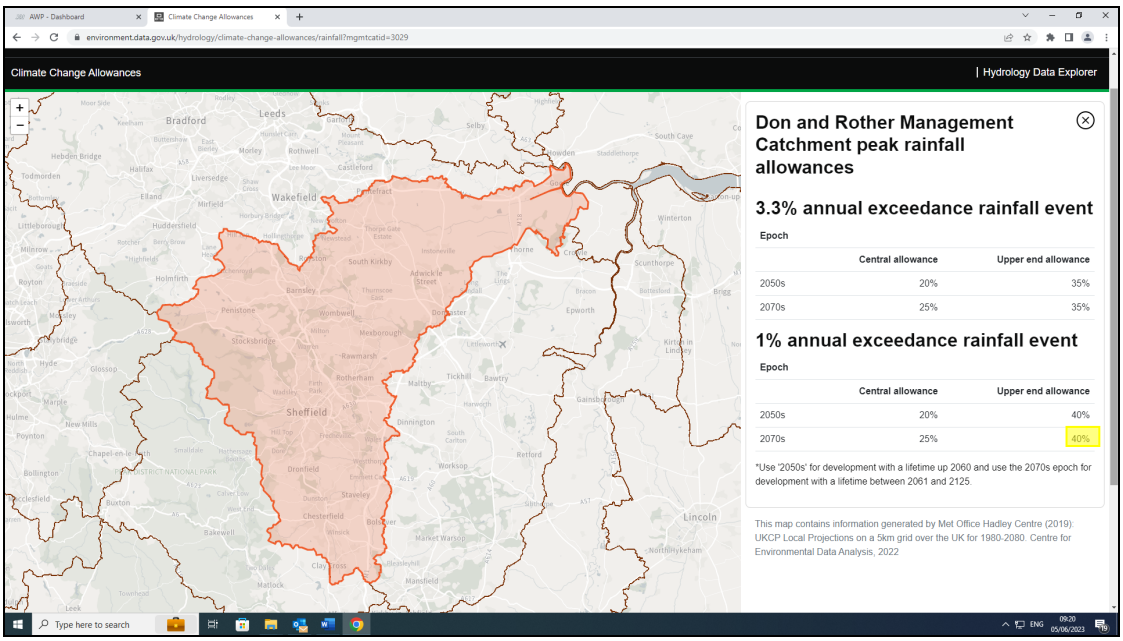
6.4 Flood Risk

6.4.1 For new developments, the current design criteria required for the surface water drainage will need to be based upon the critical 1 in 100 year storm event, with an additional allowance to account for climate change resulting from global warming. There should be no above ground flooding for the 1 in 30 year return period and no property flooding or off-site flooding from the critical 1 in 100 year storm event, with the additional allowance to account for climate change.

6.5 Climate Change

6.5.1 Based on the UK Government document “Flood Risk Assessments – Climate Change Allowances” published by the Environment Agency, the peak rainfall mapping included in Figure 3 shows that the Don and Rother Management Catchment peak rainfall allowance for the 1% annual exceedance rainfall event (upper end allowance) is 40%.

Figure 3: Don and Rother Management Catchment Peak Rainfall Map



6.5.2 An additional allowance of 40% has therefore been included in the preliminary surface water drainage design to account for the anticipated increase in peak rainfall due to climate change resulting from global warming.

6.6 Urban Creep

6.6.1 The project is residential with more than 10 dwellings, therefore an additional 10% allowance to the calculated impermeable roof areas will need to be included in the design to allow for urban creep.

6.7 Peak Flow Control

6.7.1 The developable area of the application site has been calculated at 0.66 ha. Based on 60% of the developable site area becoming impermeable in the form of roof areas, roads and driveways etc. the impermeable area created by the development will be approximately 3960m^2. Allowing for an additional 10% for future urban creep the impermeable area for design purposes would be 0.44ha.

6.7.2 Based upon the IH124 run-off rate and the contributing area the greenfield equivalent run-off rate would equate to 0.62l/s, which cannot be achieved in practical terms.

6.7.3 To avoid future blockages, maintenance issues, and as it is intended for Yorkshire Water to adopt the drainage system, the lowest discharge rate which can be achieved is 3.5l/s and has been used for design purposes. Yorkshire Water have agreed to this discharge rate, refer to Appendix C for confirmation.

6.8 Design Output

6.8.1 Based upon the design criteria set out above, hydraulic model calculations have been undertaken in order to assess the pipe sizes and gradients required and to assess the likely volume of surface water storage volumes which will need to be provided.

6.8.2 The design work undertaken has shown that a gravity connection to the public sewer should be achievable.

6.8.3 On this basis the restriction to the discharge will be provided by means of an appropriate flow control device.

6.8.4 However, if it is found at the detailed design stage that a gravity connection cannot be achieved, then it will be necessary for a pumped outfall to be provided incorporating a pump station and rising main constructed to adoptable standards.

6.8.5 A summary of the storage volumes required is set out in Table 5 below.

Table 5: Volume of Surface Water Storage Required

Storm Event	1 in 1 Probability Storm Event	1 in 30 Probability Storm Event	1 in 100 Probability Storm Event + 50%
Storage Volume Required	61m^3	268m^3	343m^3
Additional Storage Volume Required	Nil	207m^3	75m^3

6.8.6 For this development it is proposed that the required volume of storage will be provided within over-sized pipes and a below-ground storage tank

6.8.7 A copy of the hydraulic model calculations is included in Appendix D.

6.9 Drawing

6.9.1 A drawing showing the proposed surface water drainage strategy for the development is included in Appendix E.

6.10 Volume Control

6.10.1 SuDS guidance advises that the run-off volume from the developed site for the 1 in 100 year 6-hour rainfall event should not exceed the greenfield run-off volume for the same event.

6.10.2 However, for this development a discharge rate of 3.5l/s has been used for design purposes.

6.10.3 We consider that the impact on the ultimate receiving watercourse has been minimised as far as is reasonably practicable.

6.11 Pollution Control

6.11.1 It is a requirement to ensure that the quality of any receiving body is not adversely affected by the development.

6.11.2 Adequate pollution control measures will consequently need to be incorporated in the detailed design of the drainage network.

6.12 Designing for Exceedance

6.12.1 Flood risk from overland exceedance flows from the new surface water drainage network and from off-site sources should be mitigated to a large extent by the new surface water drainage system.

6.12.2 The ground floor construction level of the residential building will be raised above external ground levels to shed water away from the building.

6.12.3 The existing overland flow routes should generally be maintained within the final layout of the development site without increasing the flood risk to off-site parties.

6.12.4 Any existing flood risk may reduce by the creation of a formal surface water drainage system but cannot be entirely removed.

6.12.5 Drawings showing the existing and anticipated overland surface water exceedance flood routing resulting from the development are included in Appendix F.

6.13 Highways Drainage

6.13.1 Any new drainage works will be to the required standards of the local Highway Authority and will be offered for adoption.

7.0 OPERATION AND MAINTENANCE

7.1 The drainage pipework is designed with self-cleansing gradients and consequently the network should require little or no maintenance.

7.2 All road gullies or drainage channel systems serving areas of hardstanding will need to be regularly inspected to ensure the system remains operable. See Table 6 below.

7.3 The inspection chambers should be regularly inspected to ensure the system is free-flowing. See Table 6 below.

Table 6 Operation and Maintenance Requirements for Silt Traps/Trapped Gullies (Based on CIRIA C753 Table 14.2)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	6 monthly
	Inspect filter media and establish appropriate replacement frequencies	6 monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

7.4 Operation and maintenance requirements for the attenuation storage tank are set out in Table 7 below.

Table 7: Operation and Maintenance Requirements for Attenuation Storage Tank (Based on CIRIA C753 Table 21.3)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	Remove sediment from pre-treatment structures.	Annually, or as required.
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually*
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required*
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

7.5 On the basis that a Hydro-Brake® Flow Control Device needs to be provided, then this should be maintained as set out in Table 8 below.

Table 8: Operation and Maintenance Requirements for Flow Control Device (Based on Manufacturer's recommendations)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Monthly during the first three months, then every 6 months
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months

7.6 Operation and maintenance requirements of the drainage components, as listed above, should be undertaken in accordance with Chapter 32 of the CIRIA SuDS Manual, along with the relevant tables and any relevant manufacturer's recommendations. See also BS 8582:2013 Code of Practice for Surface Water Management for Development Sites Section 11 and Susdrain Fact Sheet on SuDS Maintenance and Adoption Options (England) dated September 2015.

7.7 The personnel undertaking the maintenance should have appropriate experience of SuDS and drainage maintenance and should be capable of keeping sufficiently detailed records of any inspections. An example of a checklist for SuDS maintenance can be found within Appendix B of the CIRIA C753 SuDS Manual v2. If personnel do not have appropriate experience, then specific inspection visits may be necessary. During the first year of operations of SuDS, inspections should usually be carried out at monthly intervals (and after significant storm events).

7.8 The responsibility for the operation and maintenance of the drainage and SuDS will lie with Yorkshire Water Services or any subsequent landowner of the site.

7.9 The highway drainage will form part of the Section 38 Agreement with the Highway Authority who will be responsible for future maintenance works.

7.10 The domestic drainage will remain the responsibility of the individual householders.

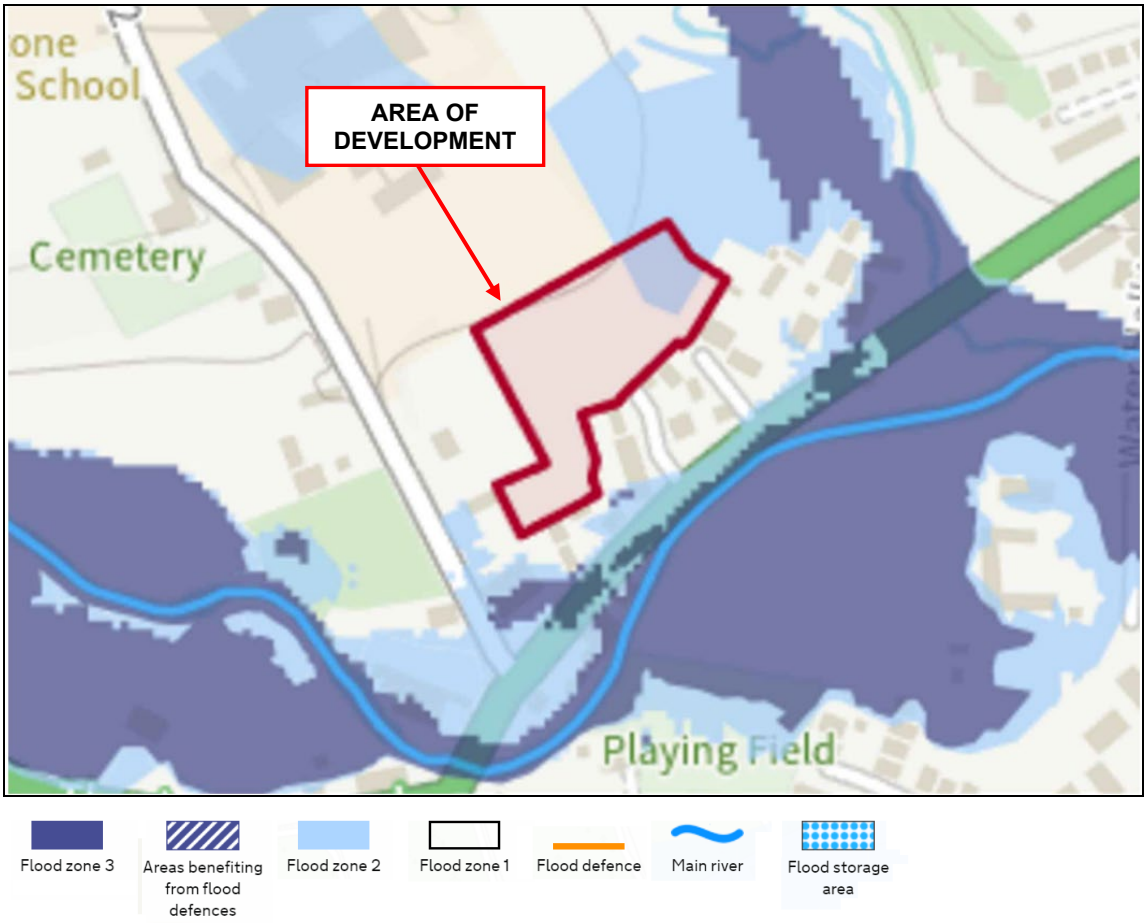
8.0 FLOOD RISK ASSESSMENT

8.1 Flood Zone

8.1.1 A copy of the Environment Agency Flood Map for Planning is included in Figure 4 below which identifies that the majority of the development site to be located within Flood Zone 1, (low probability of flooding), with a less than 1 in 1000 annual probability of flooding in any year.

8.1.2 The north eastern corner of the development site is shown to lie in Flood Zone 2, (medium probability of flooding), comprising land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between a 1 in 200 and 1 in 1000 annual probably of sea flooding in any year.

Figure 4: Environment Agency Flood map for planning dated November 2023



8.2 Fluvial / Tidal Flooding

8.2.1 The River Don lies approximately 100m to the south of the site. The application site is shown to be sufficiently elevated above this potential source of flooding and therefore foul water domestic waste can discharge to the 150mm diameter public foul sewer recorded in Watermill Gardens, at a point to the south of the site.

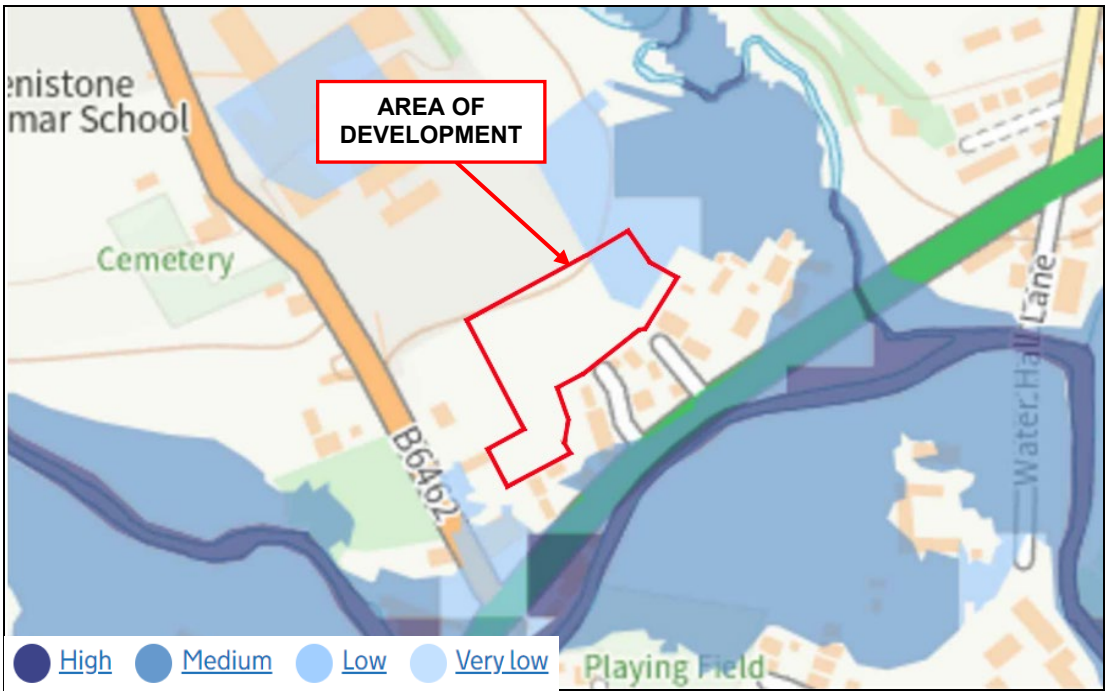
8.2.2 The risk of flooding from this potential flood source is therefore considered to pose no risk to the development.

8.2.3 Scout Dike lies approximately 200m to the north east of the site. The development is shown to lie at the outer extent of potential flooding from this watercourse.

8.2.4 As the development is shown to be at risk of potential flooding, flood mitigation measures will need to be incorporated within the design of the development. Details of such measures are incorporated in Section 9 of this report.

8.2.5 A copy of the flood map produced from the Environment Agency showing the extent of flooding from rivers or the sea is included in Figure 5 below.

Figure 5: Environment Agency map dated August 2023 showing the extent of Flooding from rivers or the sea

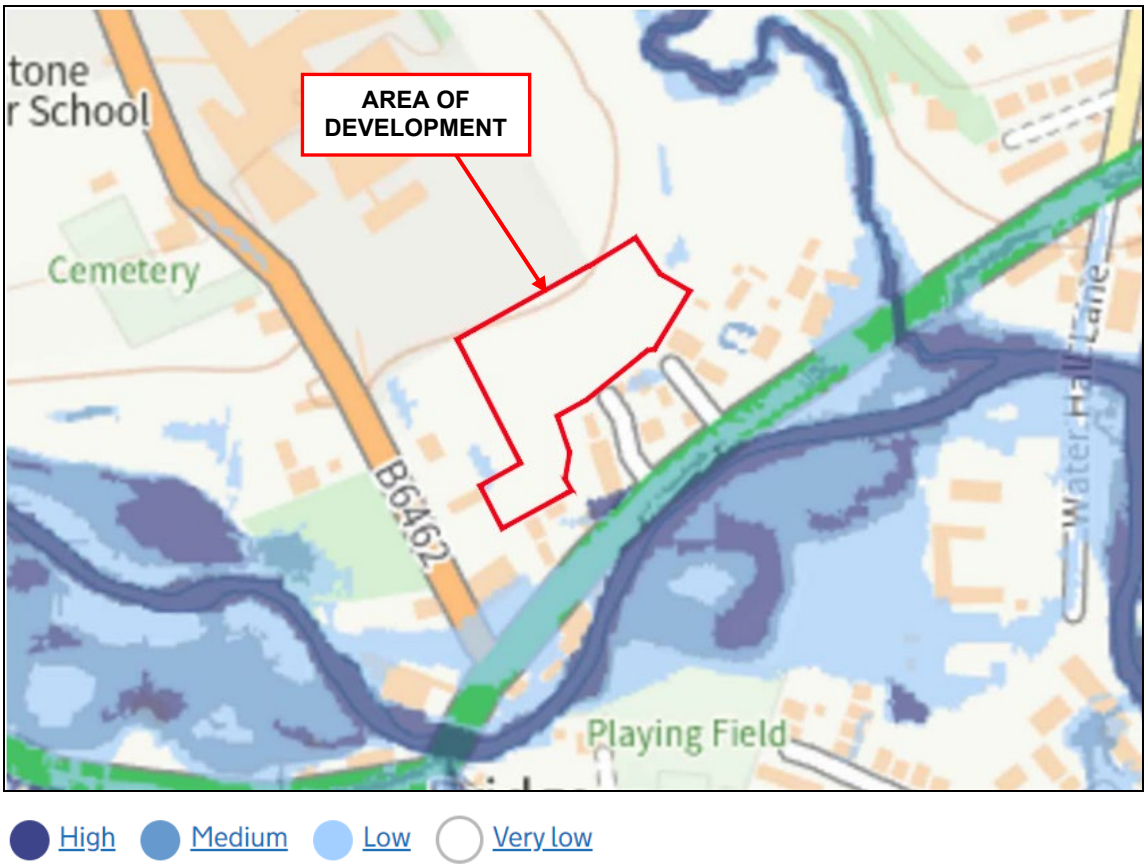


8.2.6 The map shows that the majority of the site is not at risk of flooding, whilst the north eastern corner of the site is shown to be at 'low risk' of flooding.

8.3 Surface Water Flooding

8.3.1 A copy of the Environment Agency map showing the extent of flooding from surface water is included in Figure 6 below.

Figure 6: Environment Agency map dated August 2023 showing the extent of flooding from surface water



8.3.2 The map shows that the majority of the site lies in an area which is classed as being at 'very low risk' from overland surface water flooding. There are, however, isolated pockets of land within the site which are shown to be at 'low risk' from overland surface water flooding.

8.3.3 Copies of the maps produced by the Environment Agency showing the likely depth of surface water flooding for various risk scenarios are included in Figures 7, 8 and 9 below.

Figure 7: Environment Agency map dated August 2023 showing the likely depth of flooding from surface water – low risk

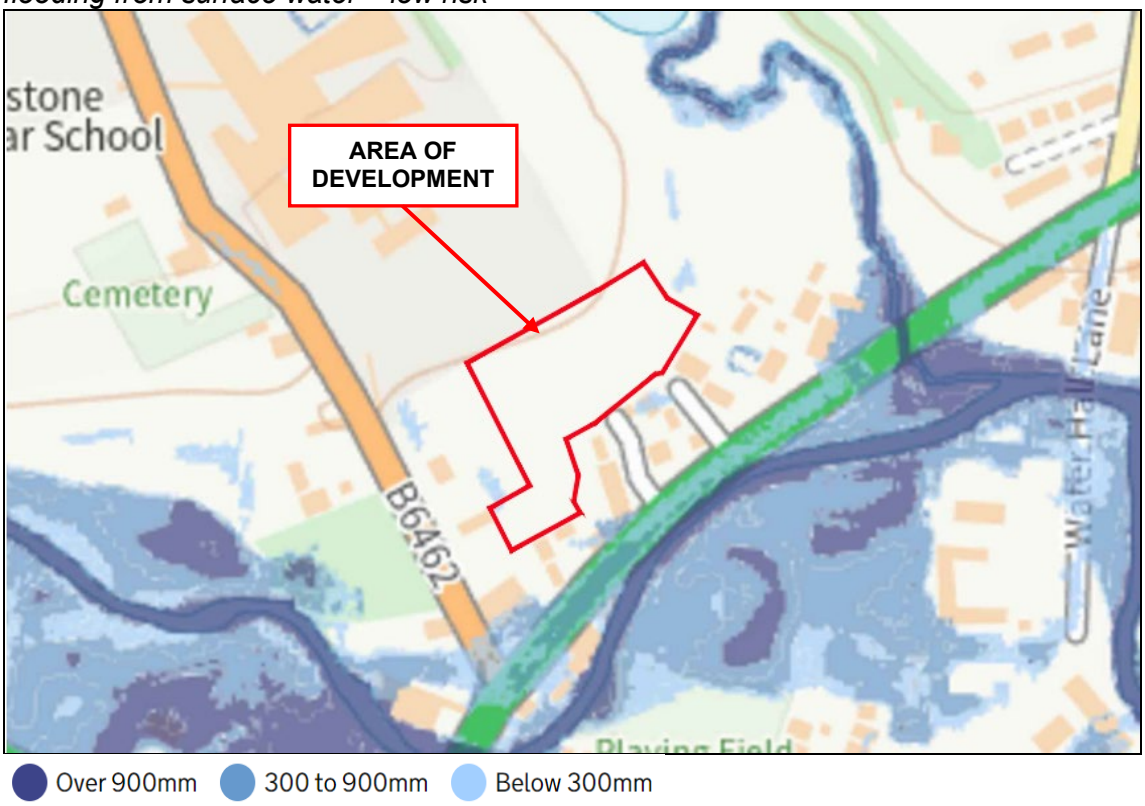
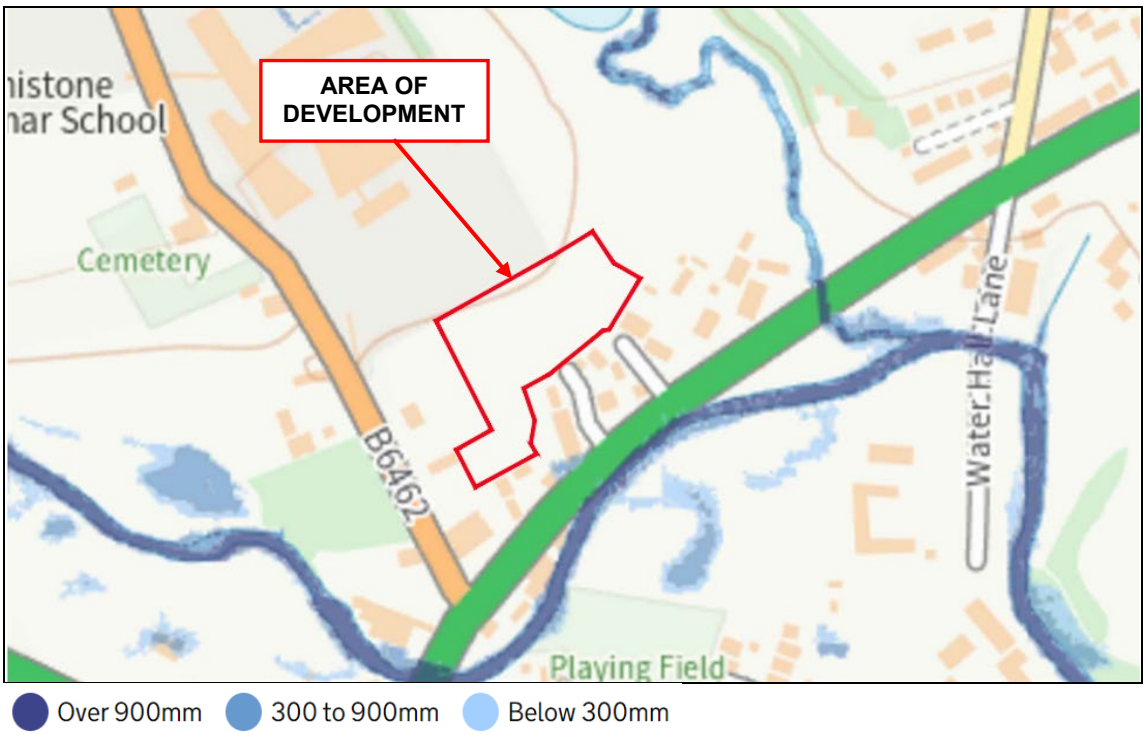


Figure 8: Environment Agency map dated August 2023 showing the likely depth of flooding from surface water – medium risk

Figure 9: Environment Agency map dated August 2023 showing the likely depth of flooding from surface water – high risk



8.3.4 For a 'low risk' scenario the map shows that the areas at risk from overland surface water flooding will be less than 300mm

8.3.5 For a 'medium risk' scenario the map shows that the site is not prone to surface water flooding.

8.3.6 For a 'high risk' scenario the map shows that the site is not prone to surface water flooding.

8.4 Flooding from Open Drainage Ditches

8.4.1 There are no open drainage ditches located within the development site.

8.4.2 The risk of flooding from this potential flood source is therefore considered to be low and acceptable.

8.5 Groundwater Flooding

8.5.1 Groundwater flooding can occur when the sub-surface water levels are high and emerges above ground level.

8.5.2 The site is shown to overlay a Secondary A Aquifer and lies in an area where the groundwater vulnerability classification is 'low'.

8.5.3 It is not anticipated that the proposed development will involve deep excavation works and consequently the risk to the development from this potential flood source is considered to be low and acceptable.

8.6 Flood Risk from Existing Water Mains

8.6.1 There are existing water mains present serving the adjacent residential properties.

8.6.2 There are no known issues with regard to the condition of any such water mains.

8.6.3 The risk of flooding to the development from this potential flood source is therefore considered to be low and acceptable.

8.7 Flood Risk from Existing Drainage Services/Sewers

8.7.1 There are existing sewers present serving the adjacent residential properties.

8.7.2 There are no known issues with regard to the condition of any such drainage services.

8.7.3 The risk of flooding to the development from this potential flood source is therefore considered to be low and acceptable.

8.8 Flood Risk from New Drainage Services

8.8.1 The drainage will be designed to the required standards (as detailed in Section 6) and therefore the risk of flooding to the development or to other parties beyond the curtilage of the site will be adequately addressed.

8.8.2 The risk to the development from this potential source is therefore considered to be low and acceptable.

8.9 Flooding from Reservoirs, Canals and Other Artificial Sources

8.9.1 A study of the local region shows that there are a number of water features in the local vicinity of the development.

8.9.2 There are open ponds in proximity to Scout Dike approximately 200m and 450m to the north east of the development.

8.9.3 Due to their small scale and distance from the site they are not considered to pose any risk of flooding to the development should they overtop during an extreme rainfall event.

8.9.4 Scout Dike Reservoir is situated approximately 1.3km to the north east of the site.

8.9.5 Royd Moor Reservoir is situated approximately 2.3km to the north west of the site.

8.9.6 Inbirchworth Reservoir is situated approximately 3.6km to the north west of the site.

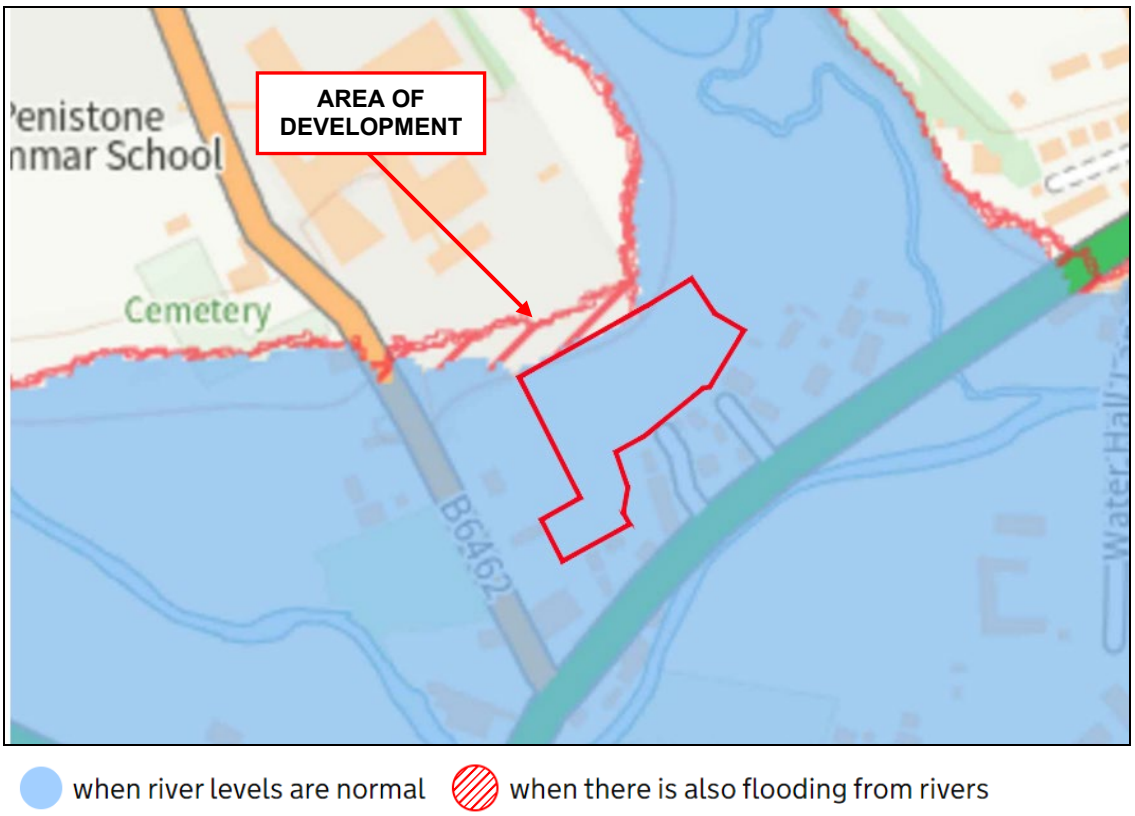
8.9.7 Langsett Reservoir is situated approximately 4.8km to the south west of the site.

8.9.8 Midhope Reservoir is situated approximately 5km to the south west of the site.

8.9.9 Underbank Reservoir is situated approximately 4.5km to the south of the site.

8.9.10 A copy of the map produced by the Environment Agency showing the extent of flooding from reservoirs is included in Figure 10 below.

Figure 10: Environment Agency map dated August 2023 showing the extent of flooding from reservoirs



8.9.11 The map shows that the development site is not considered to be at risk from reservoir flooding during normal river conditions but is at risk if there is a combined failure of the local reservoir defences when there is a major fluvial flood event in the local region. However, the likelihood of both these events occurring concurrently is extremely remote and consequently, the risk to the development from reservoir flooding is considered to be low and acceptable.

8.9.12 However, such an occurrence is extremely remote as reservoir defences are inspected and maintained on a regular basis by the Environment Agency. Consequently, the risk to the development from reservoir flooding is considered to be low and acceptable.

9.0 FLOOD MITIGATION MEASURES

9.1 A sequential approach has been taken and all of the residential development has been located in Flood Zone 1 to ensure that the dwellings are not at risk from fluvial flooding.

9.2 The area of the application site shown to lie in Flood Zone 2 will comprise public open space.

9.3 On this basis it is considered that there will be no requirement to incorporate any flood mitigation measures within the design of the new residential properties.

10.0 SUMMARY

10.1 This report has been prepared to assess the flood risk and drainage implications for a proposed residential development on land located to the north of Barnsley Road, Penistone, to the north of Watermill Gardens.

10.2 The majority of the site falls in Flood Zone 1 (low probability of flooding) on the Flood Map for Planning produced by the Environment Agency, with the north eastern area of the site shown to lie in Flood Zone 2 (medium probability of flooding).

10.3 The proposals are considered to be 'More Vulnerable' development in terms of flood vulnerability (Table 3) which is considered to be appropriate in this location (Table 4).

10.4 This report has considered potential sources of flooding to the site, including fluvial, surface water, groundwater, existing sewers, water mains and other artificial sources.

10.5 The main potential flood risk to the development which has been identified is from fluvial flooding from Scout Dike during an extreme rainfall event.

10.6 A sequential approach has been taken and the residential area of the development has been located in Flood Zone 1, with public open space located in Flood Zone 2.

10.7 On this basis it is considered that there is no requirement for any additional flood mitigation measures to be provided within the design of the development.

10.8 This report demonstrates that the overall risk of flooding to the development is considered to be low and acceptable and will not increase the risk of flooding to other parties beyond the curtilage of the site.

10.9 This report also demonstrates that the site can be suitably drained, with the drainage network serving the development designed and constructed to the required standards in compliance with local and national planning policies.

10.10 Surface water run-off from the development will be discharged to the public sewer network.

10.11 Foul water run-off from the development will be discharged to the public sewer network located in Watermill Gardens to the south of the application site for which a formal agreement will be required.

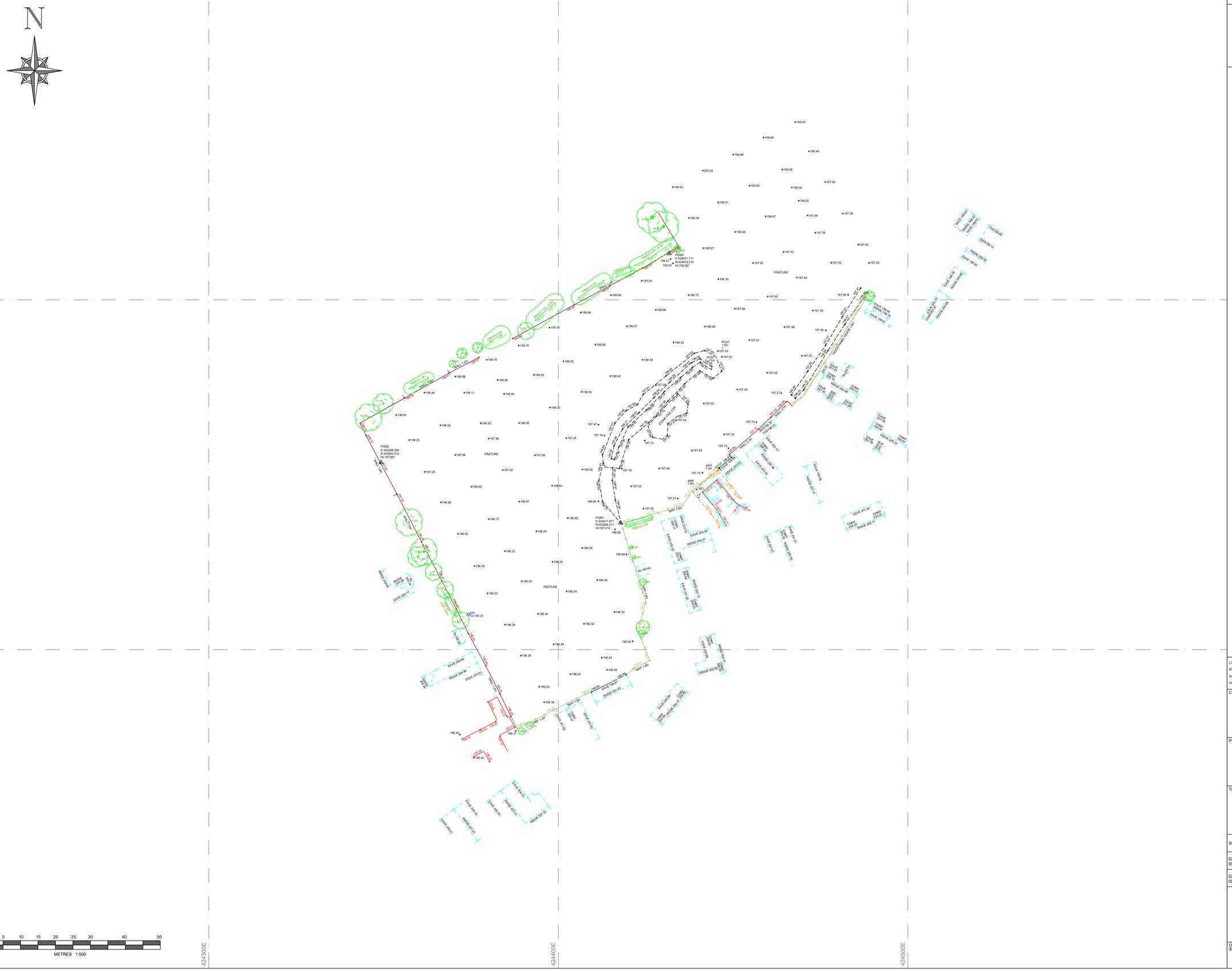
10.12 It is assumed that the foul water sewer network will be offered for adoption to Yorkshire Water under a Section 104 Agreement.

10.13 On this basis, it is considered that planning consent for the development can be granted in terms of the flood risk and drainage aspects of the application.

Alan Wood & Partners

APPENDIX A

Topographic Survey Drawing



REV	DATE ISSUED	SURVEYED	DRAWN	CHKD
A	26/10/2022	AM	DBe	AM

DESCRIPTION

FIRST ISSUE

NOTES

LEVELS ARE RELATED TO O.D. (NEWLYN).

CO-ORDINATES ARE RELATED TO NATIONAL GRID DERIVED VIA GPS - OSGB36(15) SYSTEM.

LEGEND

- + 111.71 — SPOT LEVELS
- SURVEY STATION
- TREE (CONIFEROUS)
- TREE (DECIDUOUS)
- BANK
- BUILDING
- BUILDING (3D)
- EXTENT OF SPREAD / CANOPY
- FENCE
- GRIDLINE
- KERB TOP
- ROAD
- SURFACE
- VEGETATION
- WALL

ABBREVIATIONS

BOS	BOTTOM OF SLOPE
CHMY	CHIMNEY LEVEL
CL	COVER LEVEL
H	HEIGHT
LP	LAMP POST
MH	MANHOLE
PRF	POST & RAIL FENCE
PGM	PERMANENT GROUND MARKER
RL	ROOF LEVEL
TOS	TOP OF SLOPE
WO	WASHOUT VALVE
WPF	WOOD PANEL FENCE

CLIENT

MULGRAVE PROPERTY GROUP LTD.

PROJECT

LAND OFF WATER'S MILL
PENISTONE

TITLE

TOPOGRAPHICAL SURVEY

SCALE	1:500 (UNLESS OTHERWISE STATED)	DRAWN	DBe
DATE SURVEYED	24/10/2022	CHECKED	AM
DATE ISSUED	26/10/2022	APPROVED	KS

LSTC GROUP
http://www.lstc.co.uk
Tel : 01377 253617

ORIGINAL SIZE	DRAWING NUMBER	REV
A1	06_220693_01	A

Alan Wood & Partners

APPENDIX B

Site Layout Drawing

Land off Watermill Gardens, Penistone, South Yorkshire

Electric car charging Point.

Mode 3 electric vehicle charging point with a type 2 outlet socket.

- External wall of dwelling or garage. E
- Bollard.

Enclosures

0.6m high artificial stone wall with 1.8m piers and fence panels between.

1.8m board fence.

1.2m post & rail fence.

1.2m estate railings.

External Materials.

Facing material - Artificial Stone.

Facing material - Render.

Roof tile - Natural Slate.

Soft Landscaping

Proposed tree planting.

Proposed hedging.

Proposed shrub planting.

Mown Grass.

For detailed landscape design refer to Landscape Architects drawings and specification.

Schedule of Accommodation

House Types

H4	2 b 2 St	781	04	03,124
Newton	3 B 2 St	1006	05	05,030
Farnham	4 B 2 St	1191	03	03,573
Chatsworth	4 B 2 St	1554	01	01,554
Brompton	3 B 2 St	1665	02	03,330
Kirby	6 B 2 St	2758	02	05,516
Site Total			17	22,127

Gross Site Area = 0.74 Ha (1.82 Acres)
Nett Site Area = 0.66 Ha (1.63 Acres)

13,574 SqFt Per Acre

25.75 DPH

Rev	By	Note	Date
A	JD	Proposed attenuation added.	26.10.23

Status Planning

Sketch | Planning | Tender | Construction | As Built

PRA Architecture

55 The Tannery . Lawrence Street . York . YO10 3WH T:01904 653772
E:mail@pra-architecture.com W: www.pra-architecture.com

PROJECT	Land off Watermill Gardens, Penistone, S Yorkshire		
TITLE	Proposed Site Layout		
CLIENT	Mulgrave Developments Ltd		
DATE	26.09.23	SCALE	1:500@A2
DRAWING	1286.04	REVISION	A
DRAWN	JD	CHECKED	JD

Proposed Site Layout

Alan Wood & Partners

APPENDIX C

Yorkshire Water Pre-Planning Response

YorkshireWater

Mr H Dobson
Alan Wood & Partners
341 Beverley Road
Hull
HU5 1LD
harvey.dobson@alanwood.co.uk

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax:

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

Your Ref:
Our Ref: Y010139

4th July 2022

Barnsley Road, Bridge Head, Penistone, S36 7AD – Pre-Planning Sewerage Enquiry U697790

Thank you for your recent enquiry. Our charge of £172.00 plus VAT will be added to your account with us, reference AWP054. You will receive an invoice for your account in due course.

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:

YorkshireWater

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 sewer recorded in Watermill Gardens, at a point to the south of the site.

Surface Water

The developer's attention is drawn to Requirement H3 of the Building Regulations 2010. 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.

As the proposed site is currently undeveloped no surface water is known to have previously discharged to the public sewer network

As such, the local public sewer network does not have capacity to accept any surface water from the proposed site. If SuDS are not viable, the developer is advised to contact the Environment Agency/local Land Drainage Authority/Internal Drainage Board with a view to establishing a suitable watercourse for discharge.

It is understood that the River Don is located to the south of the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable). Please note Yorkshire Water cannot provide plans of culverted watercourses or highway drains. To obtain plans please contact the Lead Local Flood Authority for more details.

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 Code 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 Code for Adoption 2021/22, pursuant to an agreement under Section 104 of the Water Industry Act 1991. We are happy to offer pre-development technical advice on any prospective sites that you would like to put forward for for adoption, prior to submission of your adoption application.

An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Sewer Adoption, Diversion and Requisition (telephone 0345 120 84 82) or email technical.sewerage@yorkshirewater.co.uk or visit - https://www.yorkshirewater.com/developers/sewerage/sewer-adoptions/ for further information.

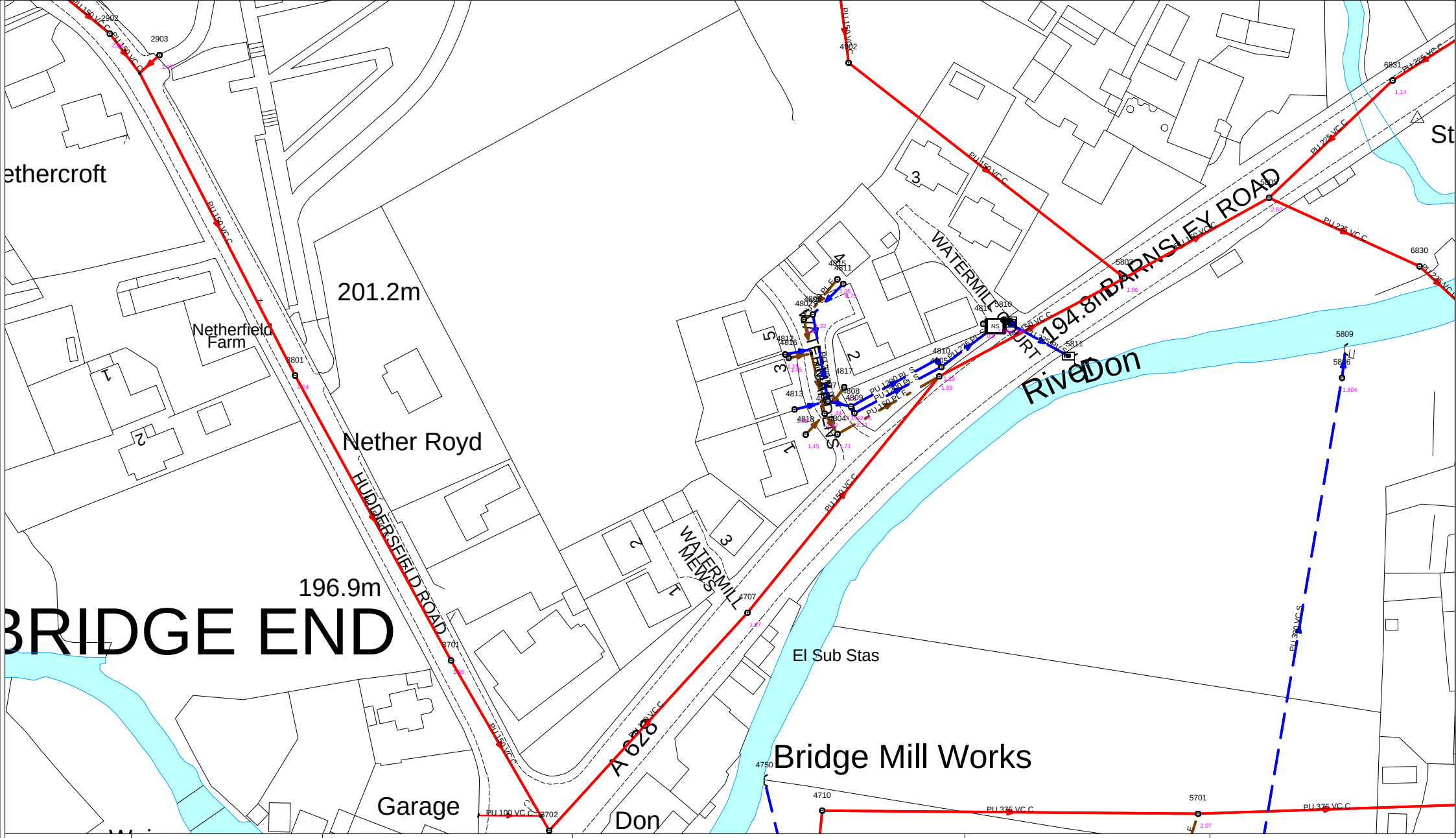
All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement.

YorkshireWater

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
Development Services Technician



424262 : 403713	Map Name : SE2403NW	Title	Partial Key
		Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS
Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : YorMap Advisor C ROBERTS Contact Tel : 87 2582			Date Req : 04/07/2022, 11:28:48 Source : Sewer Network Enquiry

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 Gen : 04/07/2022, 11:29:00

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

Daniel Cook

From: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>
Sent: 11 September 2023 12:55
To: Daniel Cook
Cc: Chris COOKE; Hollie Hammond
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Daniel,

Subject to the Requisition Team confirming the 3.5 l/s surface water will not cause detriment once the upgrade works have taken place I would have no objection.

Kind Regards

Chris Roberts
Pre-Development Technician
Developer Services
Tel: 0345 1 20 84 82

From: Daniel Cook <daniel.cook@alanwood.co.uk>
Sent: 11 September 2023 08:19
To: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>; Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Chris,

Thanks for confirming.

To achieve a minimum orifice size of 75mm, a discharge rate of 3.5l/s would be required.

On this basis, would this discharge rate be acceptable?

Regards
Daniel Cook
e: daniel.cook@alanwood.co.uk | **t:** 01482 442138
a: 341 Beverley Road | Hull | HU5 1LD
w: www.alanwood.co.uk

Alan Wood & Partners

Office locations:
Hull
Leeds
Lincoln
Scarborough
Sheffield
York

From: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>
Sent: Wednesday, September 6, 2023 11:23 AM

To: Daniel Cook <daniel.cook@alanwood.co.uk>; Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Daniel,

Subject to the Requisition Team confirming the 2.5 l/s surface water will not cause detriment once the upgrade works have taken place I would have no objection.

I cannot comment on the adoption aspect as this is not for Planning to answer.

Kind Regards

Chris Roberts
Pre-Development Technician
Developer Services
Tel: 0345 1 20 84 82

From: Daniel Cook <daniel.cook@alanwood.co.uk>
Sent: 06 September 2023 09:02
To: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>; Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Morning Chris,

Your comments are noted.

Are you able to provide clarity on the following:

1. Will payment be required immediately?
2. Can you confirm the ultimate fee?
3. What are the timescales for undertaking the feasibility study?
4. Can you confirm the anticipated extent of works? (I know this is subject to your study.)

I look forward to hearing back from you.

@Technical Sewerage Chris R,

On this basis, are you able to confirm the permitted discharge rate from our development for our system to be adopted?

This will no doubt have a bearing on the feasibility assessment.

Regards
Daniel Cook
e: daniel.cook@alanwood.co.uk | **t:** 01482 442138
a: 341 Beverley Road | Hull | HU5 1LD
w: www.alanwood.co.uk

From: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>
Sent: Wednesday, September 6, 2023 8:47 AM
To: Daniel Cook <daniel.cook@alanwood.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Daniel,

Thanks for your email.

Yes, we can still progress the alterations to the downstream network under a Major Section 185. Whilst I note you/your client have a preference over the alteration works, ultimately YW will choice the desired way forward through our feasibility study & detailed design process.

Please submit a S185 YW led major diversion application when you wish to proceed with this.

Thanks,

Chris

YorkshireWater

Chris Cooke
Sewer Diversion & Requisition Senior Engineer
Developer Services (Customer Experience)
07790 615043
yorkshirewater.com/developers

From: Daniel Cook <daniel.cook@alanwood.co.uk>
Sent: 05 September 2023 13:37
To: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Chris,

Hope you're well.

We have modelled the existing adoptable system based on the technical drawings and Yorkshire Water sewerage maps we have acquired.

This shows the existing system flooding during the 1:100 year event.

A base flow of 2.5l/s was added to the system to model our connection, and this showed a detriment to the existing system, increasing the flooding during the 1:100 year event.

Further models were undertaken to mitigate the detriment to the system in the form of increased attenuation and upgrading the HydroBrake device at the downstream of the system.

A technical report has been attached which details the models in further detail. Additionally, all models can be accessed through the below.

https://www.dropbox.com/scl/fo/t6447h01tth4zmv9a3i6w/h?rlkey=e38btpnqx693r3xg5ps51nnei&dl=0

The client wishes to undertake the mitigation the detriment in the form of upgrading the HydroBrake system. I note below that you are happy for this to be undertaken as part of an S185 application.

Can you confirm this is acceptable?

Alan Wood & Partners

Office locations:
Hull
Leeds
Lincoln
Scarborough
Sheffield
York

Regards
Daniel Cook
e: daniel.cook@alanwood.co.uk | **t:** 01482 442138
a: 341 Beverley Road | Hull | HU5 1LD
w: www.alanwood.co.uk

From: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>
Sent: Monday, July 10, 2023 2:59 PM
To: Daniel Cook <daniel.cook@alanwood.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

I'm afraid I can't Daniel, but I have attached an extract from our mapping system with depths providing, if this helps at all?

Cheers,

Chris

YorkshireWater

Chris Cooke
Sewer Diversion & Requisition Senior Engineer
Developer Services (Customer Experience)

07790 615043
yorkshirewater.com/developers

From: Daniel Cook <daniel.cook@alanwood.co.uk>
Sent: 10 July 2023 14:50
To: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Chris,

Thanks for confirming.

I am trying to pre-empt the client's comments and get an understanding of the extent of work required for each option.

Would you be at liberty to provide the as-builts of this development so this can be modelled?

Many thanks

Alan Wood & Partners

Office locations:
Hull
Leeds
Lincoln
Scarborough
Sheffield
York

Regards
Daniel Cook
e: daniel.cook@alanwood.co.uk | **t:** 01482 442138
a: 341 Beverley Road | Hull | HU5 1LD
w: www.alanwood.co.uk

From: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>
Sent: Monday, July 10, 2023 2:46 PM
To: Daniel Cook <daniel.cook@alanwood.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Daniel,

I'm afraid I can't provide the MicroDrainage model for the scheme. We would need this modelling on the as-built information too, as it probably differs from the model submitted as part of the S104 package.

I do appreciate the difficulty, but it's down to you & your client as to how you wish to proceed with this. We can certainly look at the feasibility study if you deem this to be the easier option.

Cheers,

Chris

YorkshireWater

Chris Cooke
Sewer Diversion & Requisition Senior Engineer
Developer Services (Customer Experience)
07790 615043
yorkshirewater.com/developers

From: Daniel Cook <daniel.cook@alanwood.co.uk>
Sent: 10 July 2023 14:12
To: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>; Hollie Hammond

<hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Chris,

Appreciated the quick response.

I will relay these to the client who will decide how to proceed.

Would you be at liberty to provide the MicroDrainage model provided for the adopted scheme so the proposed additional flow can be added, or would a new model need to be provided?

The difficulty in providing a new model is that we don't know the extent of the private drainage and where catchment areas are discharging to. The rainfall data will also differ from the previous model.

Alan Wood & Partners

Office locations:
Hull
Leeds
Lincoln
Scarborough
Sheffield
York

Regards
Daniel Cook
e: daniel.cook@alanwood.co.uk | **t:** 01482 442138
a: 341 Beverley Road | Hull | HU5 1LD
w: www.alanwood.co.uk

From: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>
Sent: Monday, July 10, 2023 11:51 AM
To: Daniel Cook <daniel.cook@alanwood.co.uk>; Hollie Hammond <hollie.hammond@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Daniel,

Thanks for your email.

I have discussed this with a few colleagues and from what I can see, you have two options to progress this:

1. The first is we can look to provide you with a cost to upgrade the existing surface water system to suit the increase in discharge rate, as mentioned below. We would look to do this under a Major YW led Section 185. To provide a cost, we'd need to first undertake a feasibility study. An application form is attached if you wish to proceed with this.
2. The second option is for you to model the existing downstream network & show the impact that the additional 2.5l/s from the new 17 plots has. If it can proved that no detriment to the network would occur, then a connection could be considered in principle. If detriment is shown, then you'll have no choice but to proceed with the first option.

I trust that this make sense, however if you wish to discuss, please don't hesitate to contact me.

Kind regards,

Chris

Chris Cooke
Sewer Diversion & Requisition Senior Engineer
Developer Services (Customer Experience)
07790 615043
yorkshirewater.com/developers

From: Daniel Cook <daniel.cook@alanwood.co.uk>
Sent: 10 July 2023 11:17
To: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>; Hollie Hammond <Hollie.hansell@yorkshirewater.co.uk>
Cc: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Morning Chris & Hollie,

Hope this email finds you well.

Chris Roberts has directed me to the requisitions team to provide a cost to assess and upgrade the Yorkshire Water system and flow control within the Watermill Gardens development, Penistone, South Yorkshire. The adopted Yorkshire Water drainage is attached.

It is proposed to develop 17 additional plots to the north of the Watermill Gardens development, the proposal is attached. Due to failed percolation tests and a landlocked site, it is intended to discharge into this Yorkshire Water system. Please see attached email detailing the initial enquiry.

At present, I have produced a drainage plan and model which demonstrates the proposed development can achieve a gravity connection into this system with a reduced discharge rate of 2.5l/s. I expect the alterations of this system to be, in theory, limited to increase the discharge rate of the downstream HydroBrake by 2.5l/s.

Are you able to provide a cost to review this proposal and provide a scope and associated costs to make alterations to this system to permit a connection?

I look forward to hearing from you. Thanks

Regards
Daniel Cook
e: daniel.cook@alanwood.co.uk | **t:** 01482 442138
a: 341 Beverley Road | Hull | HU5 1LD
w: www.alanwood.co.uk

Alan Wood & Partners

Office locations:
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Scarborough
Sheffield
York

From: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>
Sent: Friday, July 7, 2023 12:57 PM
To: Daniel Cook <daniel.cook@alanwood.co.uk>

Cc: Chris COOKE <Christopher.J.Cooke@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Daniel,

Hollie.hansell@yorkshirewater.co.uk & christopher.j.cooke@yorkshirewater.co.uk

Regards

Chris

From: Daniel Cook <daniel.cook@alanwood.co.uk>
Sent: 07 July 2023 11:18
To: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Chris,

Appreciate your quick response.

Are you able to provide me with Chris and Hollie's email address?

Alan Wood & Partners

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York

Regards
Daniel Cook
e: daniel.cook@alanwood.co.uk | **t:** 01482 442138
a: 341 Beverley Road | Hull | HU5 1LD
w: www.alanwood.co.uk

From: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>
Sent: Friday, July 7, 2023 11:14 AM
To: Daniel Cook <daniel.cook@alanwood.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

Hi Daniel,

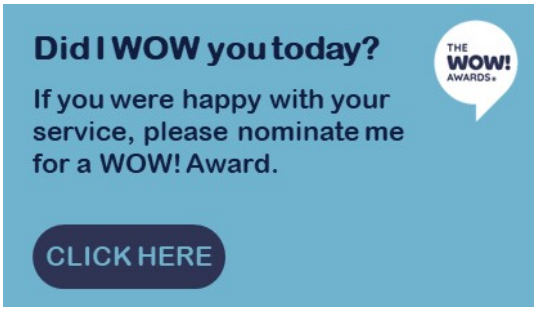
The drainage and flow control were designed and agreed specifically for the Watermill Gardens site so I would not agree to your proposal but what you can do is approach our requisitions team and get a cost for them to assess and upgrade the system and flow control in Watermill Gardens to accommodate your additional 30 properties.

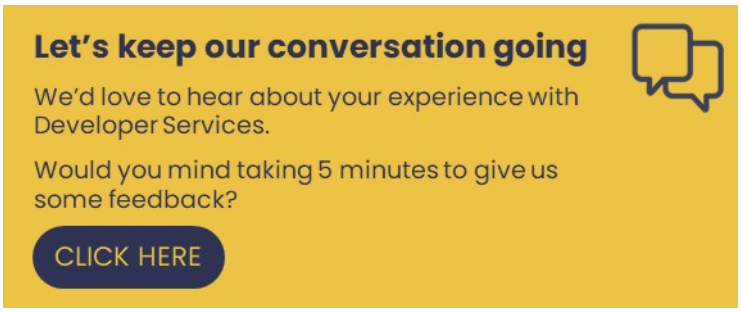
If you email Chris Cook and Hollie Hammond along with this email they will be able to advise on costs and timescales.

Kind Regards

Chris Roberts
Pre-Development Technician
Developer Services
Tel: 0345 1 20 84 82

*******Please note we have 10 working days to respond to email enquiries*******





From: Daniel Cook <daniel.cook@alanwood.co.uk>
Sent: 06 July 2023 11:31
To: Technical Sewerage <technical.sewerage@yorkshirewater.co.uk>
Subject: RE: U697790 - 47480 - Penistone Pre-Planning Enquiry

EXTERNAL SOURCE - THINK BEFORE YOU CLICK

Morning,

We received a pre-planning enquiry for the proposed residential development off Watermill Gardens, Penistone. The site plan and pre-planning enquiry are attached for reference.

Access to the site will be achieved through the recently developed residential development to the south. This drainage system serving the southern development has been adopted by Yorkshire Water, the adoptable drainage plan attached.

It is noted within the enquiry that this system does not have the capacity to accept additional flow and additional means of discharge should be sought.

The attached ground investigation notes shallow groundwater preventing percolation tests from being undertaken, therefore, infiltration as a means of discharge is not viable.

Due to the site being landlocked through third-party land, discharge to the southern watercourse is not considered viable either.

A connection to the Yorkshire Water system to the south is considered the most appropriate means of disposal. Additionally, the attached feasibility drainage plan of the southern drainage shows stub connections being provided on the northern chambers to facilitate a connection from this development.

On this basis, are you able to comment on the acceptability of a surface water connection into this system?

As the Yorkshire Water system is being restricted through a HydroBrake, it is accepted that further modelling may be required to demonstrate a connection will not imped this system.

I look forward to hearing back form you.

Alan Wood & Partners

Office locations:
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York

Regards
Daniel Cook
e: daniel.cook@alanwood.co.uk | **t:** 01482 442138
a: 341 Beverley Road | Hull | HU5 1LD
w: www.alanwood.co.uk

Alan Wood & Partners

APPENDIX D

Hydraulic Model Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.328	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.296	4-8	0.098

Total Area Contributing (ha) = 0.394

Total Pipe Volume (m^3) = 52.181

Network Design Table for Storm

Network Design Table for Storm

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

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 Storm

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
S1.000	11.894	0.079	150.0	0.078	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	4.785	0.048	100.0	0.017	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	16.542	0.033	500.0	0.017	0.00	0.0	0.600	o	900	Pipe/Conduit	
S3.000	4.771	0.048	100.0	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	11.677	0.023	500.0	0.011	0.00	0.0	0.600	o	900	Pipe/Conduit	
S4.000	15.700	0.070	224.3	0.000	5.00	0.0	0.600	o	450	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)
S1.000	46.39	5.19	196.900	0.078	0.0	0.0	0.0	1.07	42.4	9.8
S2.000	46.78	5.08	196.900	0.017	0.0	0.0	0.0	1.00	17.8	2.1
S1.001	45.67	5.38	195.514	0.112	0.0	0.0	0.0	1.39	887.1	13.8
S3.000	46.78	5.08	197.500	0.025	0.0	0.0	0.0	1.00	17.8	3.2
S1.002	45.18	5.52	195.504	0.148	0.0	0.0	0.0	1.39	887.1	18.1
S4.000	46.36	5.19	195.605	0.000	0.0	0.0	0.0	1.35	215.2	0.0

Network Design Table for Storm

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
S5.000	10.803	0.048	225.1	0.000	5.00	0.0	0.600	o	450	Pipe/Conduit	
S4.001	3.410	0.015	227.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.002	7.381	0.033	223.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.003	5.096	0.023	221.6	0.037	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.004	5.905	0.012	500.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S6.000	4.821	0.048	100.0	0.014	5.00	0.0	0.600	o	150	Pipe/Conduit	
S4.005	3.782	0.008	500.0	0.000	0.00	0.0	0.600	o	900	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)
S5.000	46.58	5.13	195.605	0.000	0.0	0.0	0.0	1.35	214.9	0.0
S4.001	46.20	5.24	195.565	0.000	0.0	0.0	0.0	1.34	213.8	0.0
S4.002	45.87	5.33	195.545	0.000	0.0	0.0	0.0	1.36	215.5	0.0
S4.003	45.65	5.39	195.524	0.037	0.0	0.0	0.0	1.36	216.6	4.6
S4.004	45.40	5.46	195.501	0.037	0.0	0.0	0.0	1.39	887.1	4.6
S6.000	46.78	5.08	197.500	0.014	0.0	0.0	0.0	1.00	17.8	1.8
S4.005	45.24	5.50	195.489	0.052	0.0	0.0	0.0	1.39	887.1	6.4

Network Design Table for Storm

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
S1.003	19.025	0.038	500.0	0.017	0.00	0.0	0.600	o	900	Pipe/Conduit	
S7.000	7.742	0.052	150.0	0.027	5.00	0.0	0.600	o	225	Pipe/Conduit	
S8.000	6.366	0.064	100.0	0.012	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	5.638	0.011	500.0	0.008	0.00	0.0	0.600	o	900	Pipe/Conduit	
S9.000	5.959	0.060	100.0	0.014	5.00	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)
S1.003	44.41	5.75	195.481	0.216	0.0	0.0	0.0	1.39	887.1	26.0
S7.000	46.63	5.12	196.250	0.027	0.0	0.0	0.0	1.07	42.4	3.4
S8.000	46.68	5.11	196.850	0.012	0.0	0.0	0.0	1.00	17.8	1.6
S1.004	44.18	5.82	195.443	0.264	0.0	0.0	0.0	1.39	887.1	31.6
S9.000	46.71	5.10	196.350	0.014	0.0	0.0	0.0	1.00	17.8	1.7

Network Design Table for Storm

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
S1.005	5.803	0.012	500.0	0.008	0.00	0.0	0.600	o	900	Pipe/Conduit	
S10.000	7.089	0.032	225.0	0.100	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	4.763	0.119	40.0	0.008	0.00	0.0	0.600	o	225	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)
S1.005	43.96	5.89	195.432	0.286	0.0	0.0	0.0	1.39	887.1	34.1
S10.000	46.66	5.11	195.750	0.100	0.0	0.0	0.0	1.04	73.8	12.6
S1.006	43.83	5.93	195.420	0.394	0.0	0.0	0.0	2.07	82.5	46.7

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	198.100	1.200	Open Manhole	1200	S1.000	196.900	225				
S2	198.500	1.600	Open Manhole	1200	S2.000	196.900	150				
S3	198.200	2.686	Open Manhole	1800	S1.001	195.514	900	S1.000	196.821	225	632
								S2.000	196.852	150	588
S4	198.700	1.200	Open Manhole	1200	S3.000	197.500	150				
SJunc 1	198.600	3.119	Junction		S1.002	195.504	900	S1.001	195.481	900	
								S3.000	197.452	150	1198
STank 2	198.480	2.875	Open Manhole	1350	S4.000	195.605	450				
STank 1	198.390	2.785	Open Manhole	1350	S5.000	195.605	450				
S5B	198.600	3.065	Open Manhole	1350	S4.001	195.565	450	S4.000	195.535	450	
								S5.000	195.557	450	
S5A	198.600	3.055	Open Manhole	1350	S4.002	195.545	450	S4.001	195.550	450	5
S5	198.700	3.188	Open Manhole	1350	S4.003	195.524	450	S4.002	195.512	450	
S6	198.600	3.099	Open Manhole	1800	S4.004	195.501	900	S4.003	195.501	450	
S7	198.700	1.200	Open Manhole	1200	S6.000	197.500	150				
SJunc 2	198.450	2.961	Junction		S4.005	195.489	900	S4.004	195.489	900	
								S6.000	197.452	150	1213
S8	198.400	2.919	Open Manhole	1800	S1.003	195.481	900	S1.002	195.481	900	
								S4.005	195.481	900	
S9	197.450	1.200	Open Manhole	1200	S7.000	196.250	225				

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S10	198.050	1.200	Open Manhole	1200	S8.000	196.850	150				
S11	197.700	2.257	Open Manhole	1800	S1.004	195.443	900	S1.003	195.443	900	
								S7.000	196.198	225	80
								S8.000	196.786	150	593
S12	197.550	1.200	Open Manhole	1200	S9.000	196.350	150				
S13	197.500	2.068	Open Manhole	1800	S1.005	195.432	900	S1.004	195.432	900	
								S9.000	196.290	150	108
S14	197.350	1.600	Open Manhole	1500	S10.000	195.750	300				
S15	197.250	1.830	Open Manhole	1800	S1.006	195.420	225	S1.005	195.420	900	
								S10.000	195.718	300	373
S	197.150	1.849	Open Manhole	0		OUTFALL		S1.006	195.301	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	424389.405	403859.644	424389.405	403859.644	Required	
S2	424397.392	403869.426	424397.392	403869.426	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S3	424399.856	403865.324	424399.856	403865.324	Required	
S4	424412.145	403877.395	424412.145	403877.395	Required	
SJunc 1	424414.405	403873.194			No Entry	
STank 2	424462.473	403889.591	424462.473	403889.591	Required	
STank 1	424446.599	403902.195	424446.599	403902.195	Required	
S5B	424446.877	403891.395	424446.877	403891.395	Required	
S5A	424444.123	403889.383	424444.123	403889.383	Required	
S5	424437.646	403885.844	424437.646	403885.844	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S6	424433.161	403883.425	424433.161	403883.425	Required	
S7	424425.714	403884.826	424425.714	403884.826	Required	
SJunc 2	424427.989	403880.575			No Entry	
S8	424424.648	403878.802	424424.648	403878.802	Required	
S9	424426.896	403858.420	424426.896	403858.420	Required	
S10	424439.288	403865.163	424439.288	403865.163	Required	
S11	424433.719	403862.079	424433.719	403862.079	Required	
S12	424440.965	403860.987	424440.965	403860.987	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S13	424436.422	403857.131	424436.422	403857.131	Required	
S14	424434.769	403848.185	424434.769	403848.185	Required	
S15	424440.207	403852.733	424440.207	403852.733	Required	
S	424443.249	403849.067			No Entry	

PIPELINE SCHEDULES for Storm

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)
S1.000	o	225	S1	198.100	196.900	0.975	Open Manhole	1200
S2.000	o	150	S2	198.500	196.900	1.450	Open Manhole	1200
S1.001	o	900	S3	198.200	195.514	1.786	Open Manhole	1800
S3.000	o	150	S4	198.700	197.500	1.050	Open Manhole	1200
S1.002	o	900	SJunc 1	198.600	195.504	2.196	Junction	

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)
S1.000	11.894	150.0	S3	198.200	196.821	1.154	Open Manhole	1800
S2.000	4.785	100.0	S3	198.200	196.852	1.198	Open Manhole	1800
S1.001	16.542	500.0	SJunc 1	198.600	195.481	2.219	Junction	
S3.000	4.771	100.0	SJunc 1	198.600	197.452	0.998	Junction	
S1.002	11.677	500.0	S8	198.400	195.481	2.019	Open Manhole	1800

PIPELINE SCHEDULES for Storm

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)
S4.000	o	450	STank 2	198.480	195.605	2.425	Open Manhole	1350
S5.000	o	450	STank 1	198.390	195.605	2.335	Open Manhole	1350
S4.001	o	450	S5B	198.600	195.565	2.585	Open Manhole	1350
S4.002	o	450	S5A	198.600	195.545	2.605	Open Manhole	1350
S4.003	o	450	S5	198.700	195.524	2.726	Open Manhole	1350
S4.004	o	900	S6	198.600	195.501	2.199	Open Manhole	1800
S6.000	o	150	S7	198.700	197.500	1.050	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)
S4.000	15.700	224.3	S5B	198.600	195.535	2.615	Open Manhole	1350
S5.000	10.803	225.1	S5B	198.600	195.557	2.593	Open Manhole	1350
S4.001	3.410	227.3	S5A	198.600	195.550	2.600	Open Manhole	1350
S4.002	7.381	223.7	S5	198.700	195.512	2.738	Open Manhole	1350
S4.003	5.096	221.6	S6	198.600	195.501	2.649	Open Manhole	1800
S4.004	5.905	500.0	SJunc 2	198.450	195.489	2.061	Junction	
S6.000	4.821	100.0	SJunc 2	198.450	197.452	0.848	Junction	

PIPELINE SCHEDULES for Storm

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)
S4.005	o	900	SJunc 2	198.450	195.489	2.061	Junction	
S1.003	o	900	S8	198.400	195.481	2.019	Open Manhole	1800
S7.000	o	225	S9	197.450	196.250	0.975	Open Manhole	1200
S8.000	o	150	S10	198.050	196.850	1.050	Open Manhole	1200
S1.004	o	900	S11	197.700	195.443	1.357	Open Manhole	1800

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)
S4.005	3.782	500.0	S8	198.400	195.481	2.019	Open Manhole	1800
S1.003	19.025	500.0	S11	197.700	195.443	1.357	Open Manhole	1800
S7.000	7.742	150.0	S11	197.700	196.198	1.277	Open Manhole	1800
S8.000	6.366	100.0	S11	197.700	196.786	0.764	Open Manhole	1800
S1.004	5.638	500.0	S13	197.500	195.432	1.168	Open Manhole	1800

PIPELINE SCHEDULES for Storm

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)
S9.000	o	150	S12	197.550	196.350	1.050	Open Manhole	1200
S1.005	o	900	S13	197.500	195.432	1.168	Open Manhole	1800
S10.000	o	300	S14	197.350	195.750	1.300	Open Manhole	1500
S1.006	o	225	S15	197.250	195.420	1.605	Open Manhole	1800

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)
S9.000	5.959	100.0	S13	197.500	196.290	1.060	Open Manhole	1800
S1.005	5.803	500.0	S15	197.250	195.420	0.930	Open Manhole	1800
S10.000	7.089	225.0	S15	197.250	195.718	1.232	Open Manhole	1800
S1.006	4.763	40.0	S	197.150	195.301	1.624	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.050	0.050	0.050
	User	-	100	0.027	0.027	0.078
2.000	User	-	100	0.017	0.017	0.017
1.001	User	-	100	0.017	0.017	0.017
3.000	User	-	100	0.009	0.009	0.009
	User	-	100	0.004	0.004	0.012
	User	-	100	0.013	0.013	0.025
1.002	User	-	100	0.011	0.011	0.011
4.000	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.000	0.000	0.000
4.003	User	-	100	0.023	0.023	0.023
	User	-	100	0.013	0.013	0.036
	User	-	100	0.000	0.000	0.037
	User	-	100	0.001	0.001	0.037
	User	-	100	0.000	0.000	0.037
4.004	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.009	0.009	0.009
	User	-	100	0.006	0.006	0.014
4.005	-	-	100	0.000	0.000	0.000
1.003	User	-	100	0.017	0.017	0.017
7.000	User	-	100	0.019	0.019	0.019
	User	-	100	0.007	0.007	0.026
	User	-	100	0.001	0.001	0.027
8.000	User	-	100	0.012	0.012	0.012
1.004	User	-	100	0.008	0.008	0.008
9.000	User	-	100	0.014	0.014	0.014

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.005	User	-	100	0.008	0.008	0.008
10.000	User	-	100	0.032	0.032	0.032
	User	-	100	0.000	0.000	0.033
	User	-	100	0.053	0.053	0.085
	User	-	100	0.014	0.014	0.100
1.006	User	-	100	0.008	0.008	0.008
				Total	Total	Total
				0.394	0.394	0.394

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.006	S	197.150	195.301	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	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 2	Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.000	Cv (Summer)	0.750
Return Period (years)	1	Ratio R	0.328	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S15, DS/PN: S1.006, Volume (m³): 7.6

Unit Reference	MD-SHE-0078-3500-1830-3500	Sump Available	Yes
Design Head (m)	1.830	Diameter (mm)	78
Design Flow (l/s)	3.5	Invert Level (m)	195.420
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	100
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.830	3.5	Kick-Flo®	0.697	2.2
Flush-Flo™	0.343	2.8	Mean Flow over Head Range	-	2.7

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)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.2	0.600	2.6	1.600	3.3	2.600	4.1	5.000	5.6	7.500	6.8
0.200	2.7	0.800	2.4	1.800	3.5	3.000	4.4	5.500	5.8	8.000	7.0
0.300	2.8	1.000	2.6	2.000	3.6	3.500	4.7	6.000	6.1	8.500	7.2
0.400	2.8	1.200	2.9	2.200	3.8	4.000	5.0	6.500	6.3	9.000	7.4
0.500	2.7	1.400	3.1	2.400	4.0	4.500	5.3	7.000	6.5	9.500	7.6

Storage Structures for Storm

Cellular Storage Manhole: STank 2 , DS/PN: S4.000

Invert Level (m) 195.605 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	120.0	0.0	0.800	120.0	0.0	0.801	0.0	0.0

Cellular Storage Manhole: STank 1, DS/PN: S5.000

Invert Level (m) 195.605 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	212.0	0.0	0.800	212.0	0.0	0.801	0.0	0.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	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	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.100
Region	England and Wales	Ratio R	0.323
Cv (Summer)	1.000		
Cv (Winter)	1.000		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia 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)	1, 30, 100
Climate Change (%)	0, 50, 50

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Status	Level Exceeded

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)
S1.000	S1	15 Summer	1	+0%	30/15 Summer				196.991	-0.134	0.000	0.34	
S2.000	S2	15 Summer	1	+0%	100/600 Winter				196.945	-0.105	0.000	0.19	
S1.001	S3	60 Summer	1	+0%	100/15 Summer				195.897	-0.517	0.000	0.03	
S3.000	S4	15 Summer	1	+0%	30/15 Summer				197.555	-0.095	0.000	0.29	
S1.002	SJunc 1	60 Summer	1	+0%	30/30 Summer				195.896	-0.508	0.000	0.02	
S4.000	STank 2	180 Summer	1	+0%	30/120 Summer				195.727	-0.328	0.000	0.02	
S5.000	STank 1	240 Winter	1	+0%	30/120 Summer				195.713	-0.342	0.000	0.02	
S4.001	S5B	60 Summer	1	+0%	30/15 Summer				195.760	-0.255	0.000	0.03	
S4.002	S5A	60 Summer	1	+0%	30/15 Summer				195.818	-0.177	0.000	0.03	
S4.003	S5	60 Summer	1	+0%	30/15 Summer				195.870	-0.104	0.000	0.03	
S4.004	S6	60 Summer	1	+0%	100/15 Summer				195.890	-0.511	0.000	0.01	
S6.000	S7	15 Summer	1	+0%					197.541	-0.109	0.000	0.16	
S4.005	SJunc 2	60 Summer	1	+0%	30/30 Summer				195.894	-0.495	0.000	0.00	
S1.003	S8	60 Summer	1	+0%	30/30 Summer				195.895	-0.486	0.000	0.01	
S7.000	S9	15 Summer	1	+0%	100/15 Summer				196.305	-0.170	0.000	0.13	
S8.000	S10	15 Summer	1	+0%	100/480 Winter				196.886	-0.114	0.000	0.13	
S1.004	S11	60 Summer	1	+0%	30/15 Summer				195.896	-0.447	0.000	0.01	
S9.000	S12	15 Summer	1	+0%	100/15 Summer				196.388	-0.112	0.000	0.15	
S1.005	S13	60 Summer	1	+0%	30/15 Summer				195.897	-0.435	0.000	0.01	
S10.000	S14	60 Summer	1	+0%	30/15 Summer				195.900	-0.150	0.000	0.21	
S1.006	S15	60 Summer	1	+0%	1/15 Summer				195.897	0.252	0.000	0.06	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1		12.2	OK	
S2.000	S2		2.6	OK	
S1.001	S3		11.5	OK	
S3.000	S4		3.9	OK	
S1.002	SJunc 1		10.7	OK*	
S4.000	STank 2	151	2.7	OK	
S5.000	STank 1	154	2.7	OK	
S4.001	S5B		4.0	OK	
S4.002	S5A		3.6	OK	
S4.003	S5		3.8	OK	
S4.004	S6		3.8	OK	
S6.000	S7		2.3	OK	
S4.005	SJunc 2		3.8	OK*	
S1.003	S8		3.3	OK	
S7.000	S9		4.2	OK	
S8.000	S10		1.9	OK	
S1.004	S11		4.3	OK	
S9.000	S12		2.2	OK	
S1.005	S13		3.6	OK	
S10.000	S14		11.2	OK	
S1.006	S15		2.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	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	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.100
Region	England and Wales	Ratio R	0.323
Cv (Summer)	1.000		
Cv (Winter)	1.000		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia 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)	1, 30, 100
Climate Change (%)	0, 50, 50

WARNING: Half Drain Time has not been calculated as the structure is too full.

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)

PN	US/MH Name	Status	Level Exceeded

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S1.000	S1	15 Summer	30	+50%	30/15 Summer				197.161	0.036	0.000	1.24	
S2.000	S2	15 Summer	30	+50%	100/600 Winter				196.994	-0.056	0.000	0.70	
S1.001	S3	30 Summer	30	+50%	100/15 Summer				196.414	0.000	0.000	0.12	
S3.000	S4	15 Summer	30	+50%	30/15 Summer				197.652	0.002	0.000	1.03	
S1.002	SJunc 1	30 Summer	30	+50%	30/30 Summer				196.407	0.003	0.000	0.10	
S4.000	STank 2	600 Winter	30	+50%	30/120 Summer				196.245	0.190	0.000	0.01	
S5.000	STank 1	600 Winter	30	+50%	30/120 Summer				196.245	0.190	0.000	0.02	
S4.001	S5B	720 Winter	30	+50%	30/15 Summer				196.246	0.231	0.000	0.04	
S4.002	S5A	720 Winter	30	+50%	30/15 Summer				196.246	0.251	0.000	0.04	
S4.003	S5	30 Summer	30	+50%	30/15 Summer				196.275	0.301	0.000	0.03	
S4.004	S6	30 Summer	30	+50%	100/15 Summer				196.356	-0.045	0.000	0.01	
S6.000	S7	15 Summer	30	+50%					197.585	-0.065	0.000	0.61	
S4.005	SJunc 2	30 Summer	30	+50%	30/30 Summer				196.399	0.010	0.000	0.00	
S1.003	S8	30 Summer	30	+50%	30/30 Summer				196.406	0.025	0.000	0.01	
S7.000	S9	30 Summer	30	+50%	100/15 Summer				196.429	-0.046	0.000	0.45	
S8.000	S10	15 Summer	30	+50%	100/480 Winter				196.923	-0.077	0.000	0.48	
S1.004	S11	30 Summer	30	+50%	30/15 Summer				196.420	0.077	0.000	0.01	
S9.000	S12	30 Summer	30	+50%	100/15 Summer				196.435	-0.065	0.000	0.50	
S1.005	S13	30 Summer	30	+50%	30/15 Summer				196.428	0.096	0.000	0.01	
S10.000	S14	30 Summer	30	+50%	30/15 Summer				196.501	0.451	0.000	0.89	
S1.006	S15	30 Summer	30	+50%	1/15 Summer				196.434	0.789	0.000	0.06	

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

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1		45.0	SURCHARGED	
S2.000	S2		9.6	OK	
S1.001	S3		55.2	OK	
S3.000	S4		14.1	SURCHARGED	
S1.002	SJunc 1		66.4	SURCHARGED*	
S4.000	STank 2		1.7	SURCHARGED	
S5.000	STank 1		2.6	SURCHARGED	
S4.001	S5B		4.5	SURCHARGED	
S4.002	S5A		4.9	SURCHARGED	
S4.003	S5		3.4	SURCHARGED	
S4.004	S6		3.5	OK	
S6.000	S7		8.3	OK	
S4.005	SJunc 2		3.5	SURCHARGED*	
S1.003	S8		3.9	SURCHARGED	
S7.000	S9		14.3	OK	
S8.000	S10		7.1	OK	
S1.004	S11		3.0	SURCHARGED	
S9.000	S12		7.4	OK	
S1.005	S13		3.3	SURCHARGED	
S10.000	S14		47.8	SURCHARGED	
S1.006	S15		2.8	SURCHARGED	

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

Simulation Criteria

Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	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	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	19.100
Region	England and Wales	Ratio R	0.323
Cv (Summer)	1.000		
Cv (Winter)	1.000		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia 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)	1, 30, 100
Climate Change (%)	0, 50, 50

WARNING: Half Drain Time has not been calculated as the structure is too full.

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)

PN	US/MH Name	Status	Level Exceeded

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

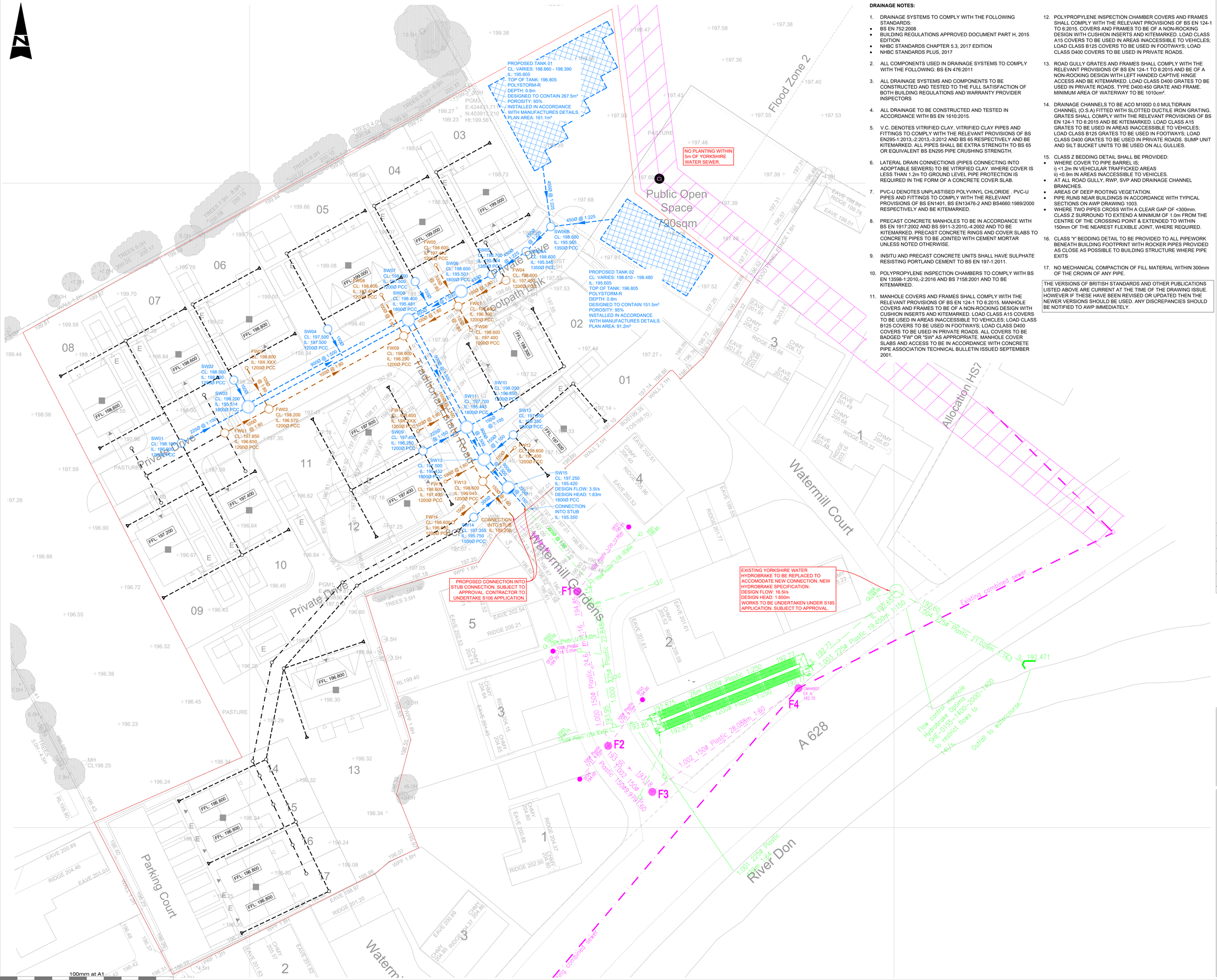
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S1.000	S1	15 Summer	100	+50%	30/15 Summer				197.245	0.120	0.000	1.60	
S2.000	S2	720 Winter	100	+50%	100/600 Winter				197.147	0.097	0.000	0.08	
S1.001	S3	720 Winter	100	+50%	100/15 Summer				197.146	0.732	0.000	0.02	
S3.000	S4	15 Summer	100	+50%	30/15 Summer				197.687	0.037	0.000	1.37	
S1.002	SJunc 1	720 Winter	100	+50%	30/30 Summer				197.146	0.742	0.000	0.01	
S4.000	STank 2	720 Winter	100	+50%	30/120 Summer				197.146	1.091	0.000	0.01	
S5.000	STank 1	720 Winter	100	+50%	30/120 Summer				197.146	1.091	0.000	0.02	
S4.001	S5B	720 Winter	100	+50%	30/15 Summer				197.146	1.131	0.000	0.04	
S4.002	S5A	720 Winter	100	+50%	30/15 Summer				197.146	1.151	0.000	0.04	
S4.003	S5	720 Winter	100	+50%	30/15 Summer				197.147	1.173	0.000	0.04	
S4.004	S6	720 Winter	100	+50%	100/15 Summer				197.146	0.745	0.000	0.01	
S6.000	S7	15 Summer	100	+50%					197.601	-0.049	0.000	0.78	
S4.005	SJunc 2	720 Winter	100	+50%	30/30 Summer				197.147	0.758	0.000	0.00	
S1.003	S8	720 Winter	100	+50%	30/30 Summer				197.147	0.766	0.000	0.01	
S7.000	S9	720 Winter	100	+50%	100/15 Summer				197.147	0.672	0.000	0.06	
S8.000	S10	720 Winter	100	+50%	100/480 Winter				197.147	0.147	0.000	0.06	
S1.004	S11	720 Winter	100	+50%	30/15 Summer				197.146	0.803	0.000	0.01	
S9.000	S12	720 Winter	100	+50%	100/15 Summer				197.147	0.647	0.000	0.06	
S1.005	S13	720 Winter	100	+50%	30/15 Summer				197.146	0.814	0.000	0.01	
S10.000	S14	720 Winter	100	+50%	30/15 Summer				197.148	1.098	0.000	0.13	
S1.006	S15	720 Winter	100	+50%	1/15 Summer				197.146	1.501	0.000	0.07	

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

PN	US/MH Name	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1		57.9	SURCHARGED	
S2.000	S2		1.1	SURCHARGED	
S1.001	S3		7.6	SURCHARGED	
S3.000	S4		18.7	SURCHARGED	
S1.002	SJunc 1		9.9	SURCHARGED*	
S4.000	STank 2		2.1	SURCHARGED	
S5.000	STank 1		3.5	SURCHARGED	
S4.001	S5B		5.1	SURCHARGED	
S4.002	S5A		5.7	SURCHARGED	
S4.003	S5		5.5	SURCHARGED	
S4.004	S6		5.0	SURCHARGED	
S6.000	S7		10.7	OK	
S4.005	SJunc 2		4.8	SURCHARGED*	
S1.003	S8		4.3	SURCHARGED	
S7.000	S9		1.8	SURCHARGED	
S8.000	S10		0.8	SURCHARGED	
S1.004	S11		4.3	SURCHARGED	
S9.000	S12		0.9	SURCHARGED	
S1.005	S13		3.4	SURCHARGED	
S10.000	S14		6.8	FLOOD RISK	
S1.006	S15		3.4	FLOOD RISK	

APPENDIX E

Drainage Strategy Drawing



DRAINAGE NOTES:

1. DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING STANDARDS:
   - BS EN 752:2008
   - BUILDING REGULATIONS APPROVED DOCUMENT PART H, 2015 EDITION
   - NHBC STANDARDS CHAPTER 5.3, 2017 EDITION
   - NHBC STANDARDS PLUS, 2017
2. ALL COMPONENTS USED IN DRAINAGE SYSTEMS TO COMPLY WITH THE FOLLOWING: BS EN 476:2011
3. ALL DRAINAGE SYSTEMS AND COMPONENTS TO BE CONSTRUCTED AND TESTED TO THE FULL SATISFACTION OF BOTH BUILDING REGULATIONS AND WARRANTY PROVIDER INSPECTORS
4. ALL DRAINAGE TO BE CONSTRUCTED AND TESTED IN ACCORDANCE WITH BS EN 1610:2015.
5. V.C. DENOTES VITRIFIED CLAY, VITRIFIED CLAY PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN295-1:2013.-2:2013.-3:2012 AND BS 65 RESPECTIVELY AND BE KITEMARKED, ALL PIPES SHALL BE EXTRA STRENGTH TO BS 65 OR EQUIVALENT BS EN295 PIPE CRUSHING STRENGTH.
6. LATERAL DRAIN CONNECTIONS (PIPES CONNECTING INTO ADOPTABLE SEWERS) TO BE VITRIFIED CLAY. WHERE COVER IS LESS THAN 1.2m TO GROUND LEVEL PIPE PROTECTION IS REQUIRED IN THE FORM OF A CONCRETE COVER SLAB.
7. PVC-U DENOTES UNPLASTISED POLYVINYL CHLORIDE . PVC-U PIPES AND FITTINGS TO COMPLY WITH THE RELEVANT PROVISIONS OF BS EN1401, BS EN13476-2 AND BS4660:1989/2000 RESPECTIVELY AND BE KITEMARKED.
8. PRECAST CONCRETE MANHOLES TO BE IN ACCORDANCE WITH BS EN 1917:2002 AND BS 5911-3:2010,-4:2002 AND TO BE KITEMARKED. PRECAST CONCRETE RINGS AND COVER SLABS TO CONCRETE PIPES TO BE JOINTED WITH CEMENT MORTAR UNLESS NOTED OTHERWISE.
9. INSITU AND PRECAST CONCRETE UNITS SHALL HAVE SULPHATE RESISTING PORTLAND CEMENT TO BS EN 197-1:2011.
10. POLYPROPYLENE INSPECTION CHAMBERS TO COMPLY WITH BS EN 13598-1:2010,-2:2016 AND BS 7158:2001 AND TO BE KITEMARKED.
11. MANHOLE COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. MANHOLE COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN FOOTWAYS; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS. SUMP UNIT AND SILT BUCKET UNITS TO BE USED ON ALL GULLIES.
12. POLYPROPYLENE INSPECTION CHAMBER COVERS AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015. COVERS AND FRAMES TO BE OF A NON-ROCKING DESIGN WITH CUSHION INSERTS AND KITEMARKED. LOAD CLASS A15 COVERS TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 COVERS TO BE USED IN FOOTWAYS; LOAD CLASS D400 COVERS TO BE USED IN PRIVATE ROADS.
13. ROAD GULLY GRATES AND FRAMES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015 AND BE OF A NON-ROCKING DESIGN WITH LEFT HANDED CAPTIVE HINGE ACCESS AND BE KITEMARKED. LOAD CLASS D400 GRATES TO BE USED IN PRIVATE ROADS. TYPE D400:450 GRATE AND FRAME. MINIMUM AREA OF WATERWAY TO BE 1010cm².
14. DRAINAGE CHANNELS TO BE ACO M100D 0.0 MULTIDRAIN CHANNEL (O.S.A) FITTED WITH SLOTTED DUCTILE IRON GRATING. GRATES SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 124-1 TO 6:2015 AND BE KITEMARKED. LOAD CLASS A15 GRATES TO BE USED IN AREAS INACCESSIBLE TO VEHICLES; LOAD CLASS B125 GRATES TO BE USED IN FOOTWAYS; LOAD CLASS D400 GRATES TO BE USED IN PRIVATE ROADS. SUMP UNIT AND SILT BUCKET UNITS TO BE USED ON ALL GULLIES.
15. CLASS Z BEDDING DETAIL SHALL BE PROVIDED:
    - WHERE COVER TO PIPE BARREL IS;
      i) <1.2m IN VEHICULAR TRAFFICKED AREAS
      ii) <0.9m IN AREAS INACCESSIBLE TO VEHICLES.
    - AT ALL ROAD GULLY, RWP, SVP AND DRAINAGE CHANNEL BRANCHES.
    - AREAS OF DEEP ROOTING VEGETATION.
    - PIPE RUNS NEAR BUILDINGS IN ACCORDANCE WITH TYPICAL SECTIONS ON AWP DRAWING 1003.
    - WHERE TWO PIPES CROSS WITH A CLEAR GAP OF <300mm. CLASS Z SURROUND TO EXTEND A MINIMUM OF 1.0m FROM THE CENTRE OF THE CROSSING POINT & EXTENDED TO WITHIN 150mm OF THE NEAREST FLEXIBLE JOINT, WHERE REQUIRED.
16. CLASS 'Y' BEDDING DETAIL TO BE PROVIDED TO ALL PIPEWORK BENEATH BUILDING FOOTPRINT WITH ROCKER PIPES PROVIDED AS CLOSE AS POSSIBLE TO BUILDING STRUCTURE WHERE PIPE EXITS
17. NO MECHANICAL COMPACTION OF FILL MATERIAL WITHIN 300mm OF THE CROWN OF ANY PIPE.

THE VERSIONS OF BRITISH STANDARDS AND OTHER PUBLICATIONS LISTED ABOVE ARE CURRENT AT THE TIME OF THE DRAWING ISSUE. HOWEVER IF THESE HAVE BEEN REVISED OR UPDATED THEN THE NEWER VERSIONS SHOULD BE USED. ANY DISCREPANCIES SHOULD BE NOTIFIED TO AWP IMMEDIATELY.

1. THESE NOTES ARE INTENDED TO AUGMENT DRAWINGS AND SPECIFICATIONS. WHERE CONFLICT OF REQUIREMENTS EXIST THE ORDER OF PRECEDENCE SHALL BE AS SHOWN IN THE SPECIFICATION. OTHERWISE THE STRICTEST PROVISION SHALL GOVERN.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS.
3. DRAWINGS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER AND FURTHER INSTRUCTIONS OBTAINED BEFORE WORK IS COMMENCED.
4. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE BUILDING IS FULLY COMPLETED. IT IS THE CONTRACTORS SOLE RESPONSIBILITY TO DETERMINE THE ERECTION PROCEDURE AND SEQUENCE AND ENSURE THAT THE BUILDING AND ITS COMPONENTS ARE SAFE DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE-DOWNS WHICH MAY BE NECESSARY, SUCH MATERIAL REMAINING THE THE PROPERTY OF THE CONTRACTOR ON COMPLETION, AND FOR ENSURING THAT THE WORKS AND ANY ADJACENT PROPERTIES ARE SAFE IN THE TEMPORARY CONDITION.

KEY

- DEVELOPMENT BOUNDARY
- FLOOD ZONE 2 BOUNDARY
- PROPOSED SURFACE WATER SEWER
- PROPOSED SURFACE WATER CHAMBER
- PROPOSED SURFACE WATER HYDROBRAKE CHAMBER
- PROPOSED RAINWATER PIPE
- PROPOSED ATTENUATION TANK
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL WATER CHAMBER
- PROPOSED SOIL VENT PIPE
- EXISTING SURFACE WATER SEWER
- EXISTING SURFACE WATER CHAMBER
- EXISTING FOUL WATER SEWER
- EXISTING FOUL WATER CHAMBER
- 3m STAND-OFF DISTANCE

INDICATIVE COVER AND FINISHED FLOOR LEVELS SHOWN. TO BE CONFIRMED WITHIN DETAILED DESIGN.

NO RWP OR SVP LOCATIONS SHOWN. TO BE CONFIRMED BY ARCHITECT DURING TECHNICAL DESIGN.

Rev	Description	Date	By	Chk	App
P5	DRAINAGE AMENDMENTS	07.11.23	TG	DC	JAG
P4	ATTENUATION TANK REVISED	26.10.23	TG	DC	JAG
P3	NOTE ADDED	05.09.23	DC	DC	JAG
P2	ARCHITECTS LAYOUT UPDATED	07.08.23	HD	AD	JAG
P1	FIRST ISSUE	07.07.23	DC	DC	JAG

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Project: PROPOSED DEVELOPMENT AT LAND OFF WARERMILL GARDENS, PENISTONE

Client: MULGRAVE PROPERTY GROUP LTD

Drawing: PROPOSED DRAINAGE PLAN

Role: CIVIL ENGINEER

Drawing Status: FOR APPROVAL | Suitability Code: S3

Job. no. 47480 | Scale@ A1: 1:250 | Rev. P5

Project | Originator | Volume | Level | Type | Role | Number
MDL - AWP - ZZ - XX - DR - C - 3300

APPENDIX F

Surface Water Exceedance Flood Routing Drawings

100mm at A1

NOTES:

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KEY

= EXISTING SURFACE WATER EXCEEDANCE FLOW PATH ROUTE

Rev	Description	Date	By	Chk	App
P1	FIRST ISSUE	08.06.23	HD	AD	JAG

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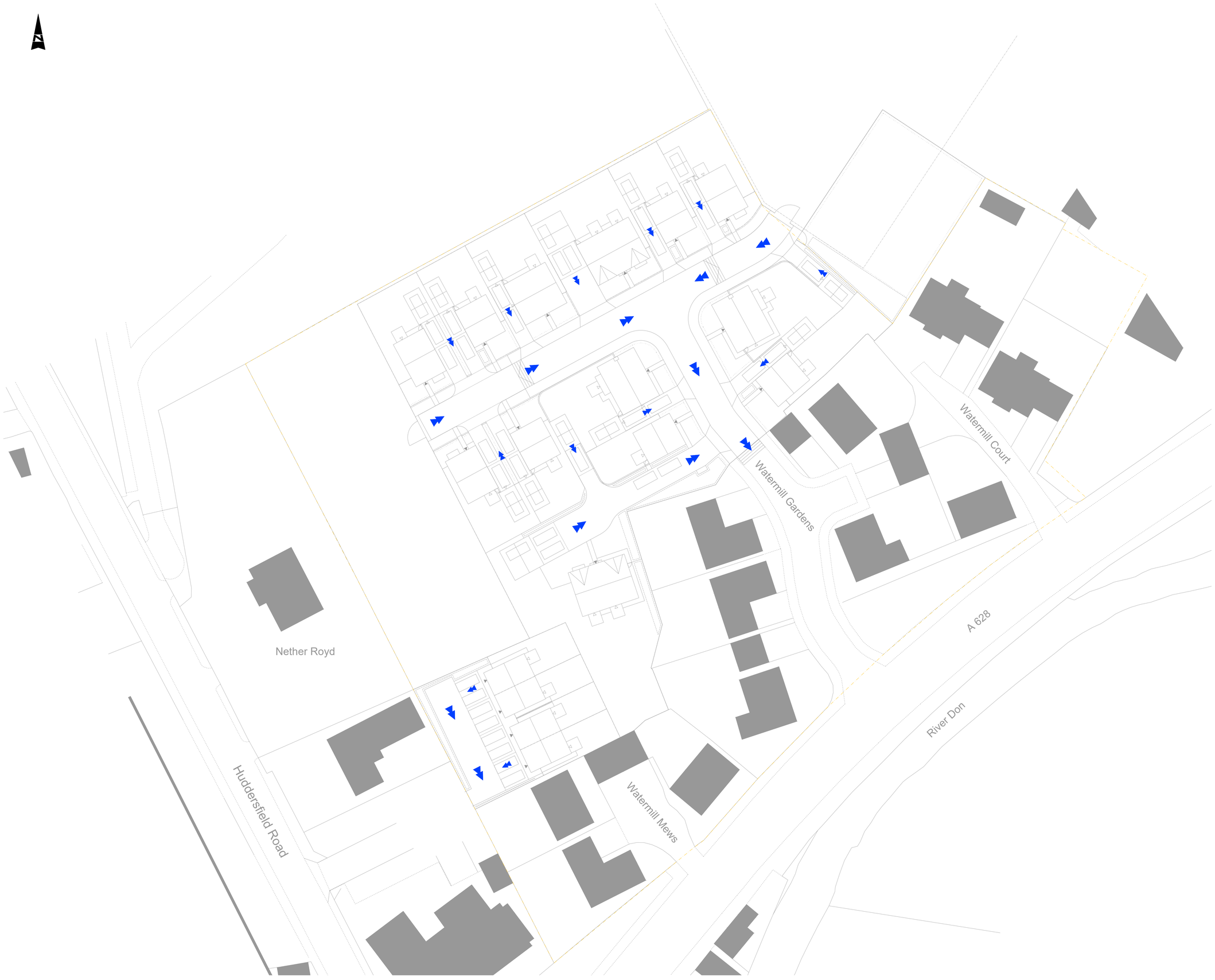
Sheffield	T. 01142 440077
York	T. 01904 611594

Project:	Proposed Development at Land off nether Mill, Penistone, Sheffield
Client:	Mulgrave Property Group Ltd
Drawing:	Existing Surface water Exceedance Flood Routing
Role:	Civil Engineer
Drawing Status:	FOR APPROVAL
Suitability Code:	-
Job. no.	47480
Scale@ A1:	N.T.S
Rev.	P1

Project	Originator	Volume	Level	Type	Role	Number
NMP	AWP	ZZ	XX	DR	C	3401



NOTES:

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KEY
= PROPOSED SURFACE WATER EXCEEDANCE FLOW PATH ROUTE

Rev	Description	Date	By	Chk	App
P2	LAYOUT UPDATED	07.08.23	HD	AD	--
P1	FIRST ISSUE	08.06.23	HD	AD	JAG

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Project: Proposed Development at Land off nether Mill, Penistone, Sheffield

Client: Mulgrave Property Group Ltd

Drawing: Proposed Surface water Exceedance Flood Routing

Role: Civil Engineer

Drawing Status: FOR APPROVAL

Suitability Code: -

Job. no. 47480

Scale@ A1: N.T.S

Rev. P2

Project	Originator	Volume	Level	Type	Role	Number
NMP	AWP	ZZ	XX	DR	C	3400

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