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FLOOD RISK ASSESSMENT AND SURFACE WATER MANAGEMENT STRATEGY

FOR PROPOSED DEVELOPMENT

at

CHAPEL LANE, PENISTONE

Prepared for

PERSIMMON HOMES WEST YORKSHIRE

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TABLE OF CONTENTS

1 INTRODUCTION 3

2 BACKGROUND 3

3 REGULATORY GUIDANCE 4

4 SITE DESCRIPTION AND HISTORY 7

5 EXISTING SITE DRAINAGE 8

6 PROPOSED DEVELOPMENT 9

7 FLOOD SOURCES AND SITE VULNERABILITY 9

8 FLOOD IMPACT AND MITIGATION MEASURES 10

9 SUDS 11

10 PROPOSED DRAINAGE STRATEGY 14

11 IMPACT OF DEVELOPMENT AND RESIDUAL RISK 16

APPENDICES

A Site Location Plan

B EA Flood Zone Plan

C Topographical Survey

D Yorkshire Water Sewer Record Plan/ Pre Development Response and Approval to connect to Surface Water Sewer.

E Planning Layout

F Drainage Strategy Plan (James Eaton Design Drawings)

G Extract Plans from Strategic Flood Risk Assessment Report

FLOOD RISK ASSESSMENT AND

SURFACE WATER MANAGEMENT STRATEGY REPORT

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1 INTRODUCTION

1.1 iD Civils Ltd (iD), have been appointed by Persimmon Homes West Yorkshire (PHWY) to prepare a Flood Risk Assessment (FRA) and surface water drainage management strategy report for the proposed residential development at Chapel Lane, Penistone, Barnsley.

1.2 The report will be undertaken in accordance with Environment Agency (EA), Barnsley Metropolitan Borough Council (BMBC) and Yorkshire Water (YW) development control policy, and will focus on:

Site Use and Current Drainage regime, Flooding History, Ground Conditions and use of SUDS, Impact of development and proposed drainage strategy, flash flooding routes and the overall impact of development on the site and surrounds.

1.3 The report is for the sole use of PHWY and presents comments and conclusions based on information available at the time of writing. iD Civils reserve the right to amend conclusions if further information is made available.

2 BACKGROUND

2.1 PHWY is seeking detailed planning permission to develop a greenfield site on the southern edge of Penistone. The site is to the north of Chapel Lane/Hartcliff Road and south of Schole Hill Lane. The development site is 4.7 Ha in area. A location plan for the site is included in Appendix A.

2.2 This Flood Risk Assessment has been undertaken with reference to the following reports, documents and plans:

- Environment Agency Flood Zone maps (EA website and SFRA)
- Barnsley Metropolitan Borough Council Strategic Flood Risk Assessment (JBA, 2010)
- Barnsley Metropolitan Borough Council Preliminary Flood Risk Assessment.
- Phase 1 (desk top) Site Investigation (iD Geoenvironmental)
- Topographical Survey
- Sewer Record Plans (Yorkshire Water)
- National Planning Policy Framework (NPPF)
- CIRIA C697 – SUDS Manual
- CIRIA C624 Development and Flood Risk

- Defra – National Standards for Sustainable Drainage Systems
- Yorkshire Water Development Control Standards

In addition, iD Civils has undertaken a walkover survey of the site. Commercially available aerial photographs and historic ordnance survey maps of the area have also been used during the preparation of the report.

2.3 **Site Walkover:** A site visit was undertaken in May 2013. During the site walkover overland flood routes onto and from the site were inspected in order to assess the risk of flooding from external sources.

3 REGULATORY GUIDANCE

3.1 National Planning Policy Framework (NPPF), along with the technical guidance to NPPF and the withdrawn PPS25 provides the regulatory framework and guidance for planning authorities in relation to Flood Issues for new developments. Any application submitted to a local planning authority will be considered in conjunction with this guidance, and dependant on the nature and location of the application, the planning authority may request a site specific Flood Risk Assessment as part of the planning application documents.

3.2 The Environment Agency is a statutory consultee to the local Planning Authority in relation to flood risk issues. The EA have responsibility for the management of Main Rivers.

3.3 BMBC is the Lead local Flood Authority (LLFA) with respect to Pensitone, and has responsibility for control and management (but not maintenance) of ordinary watercourses. The Land Drainage Act 1991 provides a regulatory framework for this issue.

3.4 BMBC appointed Jeremy Benn Associates (JBA) to prepare a Level 1 Strategic flood Risk Assessment (SFRA) which was published in 2010.

3.5 Under the Flood Risk Regulations 2009 the LLFA has a duty to prepare a Preliminary Flood Risk Assessment (PFRA). The PFRA is a high level risk assessment based on existing information where available. The process led to the publication of the BMBC PFRA in June 2011 which highlighted local areas at risk of flooding.

3.6 The EA has produced a matrix for local planning authorities, which provides advice in terms of the requirements for risk assessment. 'Environment Agency Standing Advice – Development and Flood Risk' dated February 2009 tabulates the requirements relative to the scale of the development and the applicable Flood Zone. The assessment is required for all sites larger than 1 Ha in flood Zone 1 and all sites regardless of size in Flood Zones 2 and 3.

3.7 The Environment Agency have undertaken a national study of flood risk across England and published flood maps covering the country. The maps can be viewed on the agency web site at **www.environment-agency.gov.uk**. Specific locations can be studied by searching either using postcode or address.

3.8 The EA flood maps identify 3 zones.

Flood Zone 1: This zone comprises land with a less than 1 in 1000 annual probability of river or sea flooding in any one year (<0.1%)

Flood Zone 2: This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1%-0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-0.1%) in any year.

Flood zone 3: The zone comprises land assessed as having a 1 in 100 year or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Flood risk should be assessed from the following sources; tidal and river, surface water and flooding from land, groundwater, sewers and artificial sources e.g. canals and reservoirs.

Flood zone plans reflect the undefended flood scenario for a particular area. Many flood areas are defended with flood defences of varying types and design life. Areas benefiting from flood protection are shown hatched on the EA plans.

3.9 The level of detail and complexity of a Flood Risk Assessment can vary considerably, dependant on the scale, nature and location of the planned development. EA guidance sets out the criteria for the level of information which should be included within the FRA.

3.10 The application site is within EA **Flood Zone 1** in accordance with the published EA flood zone plans. An extract of the flood risk plan is presented in appendix B.

3.11 The Technical Guidance to NPPF refers to vulnerability classifications, which are based on the sensitivity of different forms of development. In accordance with the technical guidance to NPPF, the intended end use planned for this development is classed as 'More Vulnerable' (residential). The site is therefore **appropriate** within flood zone 1.

3.12 **The Sequential Test:** In accordance with NPPF, LPA's allocating land for development should apply the Sequential test, to demonstrate that there are no available sites in the area with a lower risk of flooding. The site is within Flood Zone 1 therefore there are no sites of a lower risk in the area.

3.13 **The Exception Test:** The exception test is relevant if, following the application of the sequential test; it is not possible for the development to be allocated in zones of lower probability of flooding. The exception test criteria are detailed in The Technical practice guide of PPS25. The test provides a method of managing flood risk while still allowing necessary development to occur.

The sequential and exception test are not relevant in this particular instance.

3.14 BMBC Local Development Framework, Core Strategy Publication (Policy CSP4 – Flood Risk) states that the extent and impact of flooding will be reduced by:

- Not permitting new development where it would be at an unacceptable risk of flooding or would give rise to flooding elsewhere.
- Requiring site specific flood risk assessment for development proposals over 1 Ha in Flood zone 1.
- Requiring all development proposals on Brownfield sites to reduce surface water run-off by 30% and development on Greenfield Sites to maintain existing run-off rates.
- Requiring development sites to use Sustainable Drainage Systems in accordance with policy CSP3

3.15 Yorkshire Water work within the framework of 'Sewers for Adoption', which sets the standard for adoptable surface water and foul waters sewers. They also apply development control standards which are consistent with current best practice and Building Regulations.

3.16 Developers are encouraged to make 'pre development' enquiries to YW to ensure that there is sufficient time for the company to fully assess the capacity of their network and treatment works. This process also ensures that drainage strategies are acceptable in principle, prior to planning permission and helps avoid any objections from YW during the planning process. iD submitted a pre development enquiry in March 2013. A copy of YW's response is enclosed in appendix F.

3.17 The emerging 'Flood and Water Management Act 2010' will fundamentally change the way developers and local authorities approach the design and adoption of SuDS drainage. New SuDS Approving Bodies (SAB) will be formed to ensure adequate consideration is given to SuDS methods of drainage and the SAB will act to approve SuDS designs and adopt the constructed drainage. As LLFA BMBC is expected to be appointed as the SuDS Approval Body for this area.

3.18 A new set of SuDS standards is currently out to consultation amongst stakeholders, and will be implemented later in the year. The 7th edition of 'Sewers for Adoption' has been published, but will not be enforced by YW until the SuDS standards are adopted and the Flood and Water Management Act comes into force. The timetable for the Act coming into force is unclear. Best estimates are towards the end of 2013/early 2014.

3.19 The principles identified in the consultation SuDS standards have been considered in developing the strategy outlined in this report, on the assumption that the strategy will be consistent with best practice and that ultimately the site will come forward after the SAB's are in place.

4 SITE DESCRIPTION AND HISTORY

4.1 A site location plan is included within Appendix A of this report. Site details are summarised in the Table below.

Table 3826.1 - Site Location Summary

Detail	Remarks
Location	Approx 1KM south of Penistone Centre.
NGR	SE 241 026
Area	4.7 Ha
Current Use	Arable Farmland

4.2 **Topography:** The topographical survey and walkover survey indicate that the site is moderately sloping towards the south eastern and north eastern corners. The highest point of the site is in the north western corner adjacent to Schole Hill Lane at a level of 263.3m AOD. The lowest point is the south eastern corner with a level of 251.8m AOD. The site falls at typical gradients of approximately 1:15 to 1:20.

4.3 Chapel Lane is set approximately 1.5m below the southern edge of the site and the site is retained by a stone retaining wall close to the edge of the carriageway.

4.4 Boundaries to the site are a mixture of Hawthorn Hedges and stone walls of varying heights and condition.

4.5 There is a small barn adjacent to the track which runs up the western boundary. The barn does not appear to be positively drained.

4.6 **Adjacent Land use:** The site is bounded by the following features:

Table 3826.2 -Adjacent Land Uses

North	Arable fields
South	Chapel Lane/ Hartcliff Road then grazing land beyond
East	Existing Residential Development
West	Grazing Lane

4.7 **Previous Development:** iD Civils have reviewed the Phase 1 desk top study undertaken by iD Geoenvironmental. The report indicates that there has been no previous 'development' use on the site.

4.8 **Existing Hard standing:** The site does not contain any areas of hard standing or drained roofs.

4.9 **Hydrology:** There are no open watercourses crossing the site, or adjacent to the site. The nearest watercourse is a Coal Pit Dyke which flows easterly approximately 160m south of the site. Coal Pit Dyke ultimately flows to the River Don catchment to the east of Penistone.

4.10 The iD Geoenvironmental report confirms that the site is not within a source protection zone and there are no water abstractions within the vicinity. There have been no pollution incidents relevant to this site.

4.11 Plans contained on the EA web site do not indicate there is a problem with groundwater in this area.

5 EXISTING SITE DRAINAGE

5.1 iD has obtained a copy of the Yorkshire Water Sewerage Record plans for the area. A summary is presented below and the plans are enclosed within appendix D:

Table 3826.4 – Existing Sewers Summary

Sewer Type	Comment
Surface Water	There are no surface water sewers crossing the site. The nearest surface water sewer is within Clarel Street approximately 120 east of the site. The sewer is 225mm diameter flowing east.
Foul Water	There are no foul sewers crossing. The nearest foul sewers on the public record are within Clarel Street/St John's Close approximately 30m east of the site.
Combined Sewers	There are no combined sewers crossing the site. The nearest combined sewer is within Chapel Lane approximately 50m south east of the site. The sewer is 225mm diameter flowing north east.
Highway Drains	iD Civils has no records of highway drainage in the area.
Adoptable Sewers	There are likely to be unrecorded adopted sewers within Broomfield Walk and Chapel Field Lane to the east of the site.

5.2 There may be land drainage within the proposed site. Care should be taken to avoid damage to land drainage systems during site earthworks. Land drainage systems should be maintained or diverted around proposed new development wherever possible to avoid changing the natural drainage patterns.

5.3 Barnsley MBC development control policy states that for Greenfield sites flows must be attenuated to a maximum of 5 litres/second/hectare. The net developed area of the site is 4.28 Ha; therefore the Greenfield flow rate from the developed parts of the site is 21.4 l/s.

6 PROPOSED DEVELOPMENT

6.1 PHWY is promoting a detailed application for residential dwellings. The site will be accessed from Chapel Lane along the southern boundary by a new adoptable specification estate road. The road pattern features an internal loop for emergency vehicle circulation.

6.2 New dwellings provide a range of accommodation and styles from small terraced units to large family homes with private front and rear gardens.

6.3 Due to the retaining wall which separates the site from Chapel Lane it is anticipated that the initial section of highway access and southern most plots will be set below the level of the current site and will require significant earthworks to construct.

6.4 It is estimated (from experience of similar types of development) that the overall site may produce an impermeable fraction of around 55% of the gross site area. The total anticipated impermeable area of the proposed development is anticipated as 2.42 Ha (roofs, driveways and highways). Flows from the likely catchment could be in the order of 330 l/s in the 1 in 1 year event, and 505 l/s in the 1 in 30 year event.

6.5 Highways within the site will be offered for adoption with Barnsley Metropolitan Borough Council, via a section 38 agreement. Main sewers within the site will be offered for adoption to Yorkshire Water via a section 104 agreement. Adopting authorities will maintain the roads and sewers in perpetuity.

7 FLOOD HISTORY AND SITE VULNERABILITY

7.1 Flooding can occur from a variety of sources, including tidal, rivers, watercourses, overland run-off, groundwater, sewers and culverts. NPPF and BMBC guidance requires flood risk from all sources to be evaluated and suitable mitigation provided.

7.2 Inspection of the EA flood map indicates that the site falls within Flood Zone 1 and has a low risk of flooding from fluvial and tidal sources. A copy of the Flood Zone Plans included within Appendix B.

7.3 **Preliminary Flood Risk Assessment:** BMBC has published the PFRA in 2011. The PFRA was based on a review of historical flood information from a range of sources. Within the PRFA there are a number of plan which present details in significant areas of flood risk. Within appendix 2 there is a plan of previous recorded flood events in Penistone. Based on this plan there have been no major recorded events on the proposed site. Given the sites use there may have been localised flooding which has not cause significant harm and has not been recorded.

7.4 The PFRA does not highlight this area of Penistone as one which is at significant risk of flooding.

7.5 Extracts from plan contained within the PFRA and SFRA are contained within Appendix G of this report.

7.6 A request for detailed historical flood records has been issued to BMBC. BMBC confirm that *'I am not aware of any flooding issues associated with the site, and would confirm that to my knowledge it is not affected by any flood plains from major watercourses'*.

7.7 **Flood Vulnerability and Climate Change:** NPPF provides guidance with respect to the implications of climate change and suggests appropriate additional allowances for climate change with respect to rainfall intensities. It also recommends the following precautionary sensitivity ranges are applied to rainfall intensities for the design life of the development:

Table 3826.5 – Climate Change Allowances

Parameter	1990-2025	2025-2055	2055-2085	2085-2115
Peak Rainfall Intensity	+5%	+10%	+20%	+30%
Peak river Flow	+10%	+20%		

7.8 The Practice guide to PPS25 states that for residential development a 100 year design life should be assumed. Therefore in accordance with the above table a climate change factor of 30% should be built in to all designs where applicable to protect against future increases in rainfall.

8 FLOOD IMPACT AND MITIGATION MEASURES

8.1 NPPF guidance requires the risk from a range of potential sources to be evaluated, as follows:

8.2 **Overland Flooding:** Based on the site walkover survey, review of the topographical survey, the risk of flooding onto the site from adjacent land is low due to the relative levels between the site and its surroundings. Land to the north falls away from Schole Hill Lane. Land to the west falls towards the site but is separated from the site by an access track which forms a flood route to the south for any overland flows. Land to the east and south is lower than the site.

8.3 The risk of overland flows from the site towards adjacent land is considered low given the proposed installation of a positive drainage system designed to adoptable standards. Any risk of overland flows will be via small domestic garden catchments which will generate small volumes of run-off.

8.4 **Flooding from Rivers/Watercourses or the Sea:** The risk of flooding from the sea is low by virtue of the inland location of the site. Flood risk from fluvial sources (River or watercourses) is low due to the distance between the site and the relative levels from the site to the watercourse.

8.5 **Flooding from Culverts or field drains:** iD Civils are not aware of any existing culverts or land drains within the site.

8.6 **Flooding from Sewers:** There are no surface water sewers within the site. The nearest surface water sewer is approximately 120m east of the site within Clarel Street.

Plans contained within the SFRA indicated that areas east of the site (approx 1km) are prone to pluvial flooding.

8.7 **Flooding from artificial sources:** The YW mains records do not indicate any substantial water mains within the site or adjacent to the site. The site is not located adjacent to any reservoirs or in the flood path of any breach from a reservoir.

8.8 **Groundwater Flooding:** The PFRA and SFRA do not highlight Penistone as an area at risk from groundwater flooding. BMBC has confirmed they are not aware of any groundwater flooding issues.

8.9 **Downstream Sensitivity:** The site and immediate area downstream is not indicated as susceptible to flooding. The site is part of the River Don catchment and the River Don is prone to flooding in Thurgoland which is approximately 4 km downstream. It is important that the surface water management strategy reflects the sensitivity of the downstream receptor and mitigates against increases in run-off from the site as required in development control standards and BMBC policies.

8.10 **Development Levels:** Dwelling floor levels should be carefully considered in any low lying areas of the site, or areas which are potentially at risk from overland flows generated within the site. Dwellings at risk should be designed 300mm above the natural ground level, or be designed to produce an overland flood route around the dwelling to mitigate against the risk of internal flooding.

9 SUDS

9.1 Building Regulations (Part H), NPPF, YW and BMBC development control policies and Environment Agency advice notes, require the consideration of sustainable drainage techniques for new developments. This existing legislation is to be reinforced by the emerging Flood Water Management Act which will provide a formal structure for the adoption of SuDS drainage and further encourage their use.

9.2 Surface Water drainage should be considered in accordance with a prescribed hierarchy aimed at minimising the impact of development. Surface Water flows should be designed to discharge to:

1. Infiltration based or sustainable drainage systems
2. Watercourses
3. Surface water Sewers
4. Combined water sewers

Designers should evaluate drainage options in accordance with this hierarchy. Developer's rights to connect surface water into the drainage system under section 106 of the Water act will be withdrawn as part of the new act until it can be proven to the SAB that methods of drainage further up the hierarchy cannot be reasonably achieved.

9.3 Guidance on SUDS techniques can be found in the SUDS Manual (Ciria 2007). There are various forms of technique available as summarised below:

Table 3826.6 – Forms of SuDS Drainage

Technique	Description
Trenches	Shallow excavations filled with rubble or stone that create temporary storage and either filter into the ground or convey water to an outlet. Known as 'French drains'
Swales	Shallow linear vegetated drain ditches which can either convey flows to an outlet or infiltrate via a granular sub base to the sub strata.
Pervious Pavements	Material which allows water to permeate into underlying sub strata – best utilised on flat sites with permeable sub strata. Permeable paving can be used on clay sub strata but will require a piped drainage outlet from the sub base to a positive system.
Geocellular Systems/Tank systems	Modular plastic geocellular systems which have a high void ratio and allow water to be storage below ground. Large diameter pipework or purpose designed tanks to allow below ground storage.
Infiltration Basins	Vegetated depressions which allow water storage and slow infiltration into the ground
Detention Basins	Surface water storage basins which remain dry when not in use and allow flood water to collect and discharge to a design flow rate
Ponds	Ponds can provide both attenuation and treatment features, together with landscape and ecology value. Run off through storms is attenuated in an upper level above ambient pond depths. Many councils have published design standards if a developer intends to offer ponds for adoption. Design standards within WMDC area are covered later in this report.

9.4 The use of SUDS techniques is designed to mitigate the impact of development on receiving watercourses or sewers by mimicking pre development conditions as far as possible. New development should not worsen flooding downstream and should attempt to improve flooding wherever practical.

9.5 Sustainable Drainage can take many forms dependant on site use, layout, ground conditions and topography. In terms of the hierarchy of sustainable options, infiltration based systems should be considered in the first instance i.e. soakaways/infiltration swales/basins etc. The use of infiltration systems will be subject to the infiltration characteristics of the natural ground below the site. In areas with cohesive sub soils it is unlikely that sufficient percolation can be provided to allow the implementation of infiltration techniques.

9.6 A detailed site investigation report should be undertaken to accurately determine the nature of strata below the site and the infiltration properties. The iD Geoenvironmental desk top study confirms that the site is underlain by low permeability clays and bedrock which will not support infiltration drainage. For the purposes of this assessment it is considered that infiltration drainage will not be suitable, if however detailed intrusive investigation proves otherwise the recommended surface water strategy will need to be reviewed and sustainable drainage techniques should be used in preference to standard building practices.

9.7 Sustainable Drainage in areas of cohesive sub soils can be provided by a range of flow attenuation devices to suit the proposed development, policies of adopting authorities and planning authority requirements. Attenuation ponds and swales can provide ecological benefits by the creation of wetland habitats. Ponds can be designed to contain a permanent body of water with a freeboard capacity to attenuate peak storm events up to the 1 in 100 year plus climate change event. The detailed design and location of ponds with a permanent body of water will need to be agreed in detail with the planning authority.

9.8 Due to the sloping topography of the site and the relatively small scale of the open spaces in the south and centre of the site, the provision of a pond/basing feature to attenuate surface water flows would not be possible within adoptable design parameters.

9.9 Provision of attenuation storage volume by underground tanks or oversize sewers is also an acceptable form of SUDS drainage and in many cases may provide the most practical solution to meet the requirements of guidance due to the availability of land or other constraints, particularly in small infill sites of this nature.

10 PROPOSED DRAINAGE STRATEGY

10.1 The development of the site will require a new drainage system designed to suit the final approved layout, and in compliance with current Building Regulations and Sewers for Adoption. The system will be adopted by YW under a section 104 agreement.

10.2 A drainage strategy can be determined based on the available information and regulator liaison to date. This strategy is illustrated on the plan within appendix F. A summary is provided below:

10.3 **Foul Drainage:** iD Civils has undertaken a 'pre-development enquiry' with YW. The response to our enquiry is contained within appendix D.

Yorkshire Water confirms that:

'Foul water domestic flows should discharge to the 225mm diameter public foul sewer recorded in Clarel Street, at a point approximately 90m from the site. Alternatively the site may also discharge to the 225mm diameter public combined sewer recorded in Chapel Lane, at a point approximately 100m from the site.

Discussion: The foul sewer in Clarel Street is at a higher level than the lowest part of the site. Any connection to this sewer would require a pumped outfall. The combined sewer in Chapel Lane can be reached by gravity. It is considered that the most sustainable option for foul sewerage is to connect to the combined sewer in Chapel Lane.

10.4 **Surface Water and SuDS Hierarchy:** In accordance with the hierarchy contained within Part H of the building regulations, NPPF and the emerging SuDS standards, the surface water strategy should be considered in order of the sustainable hierarchy. The hierarchy and ability of the site to support the particular elements of the hierarchy are discussed below:

10.5 **Discharge to infiltration drainage/soakaway:** The ability of any development to discharge to infiltration drainage is wholly reliant on the ground conditions across the site. The desk top study site investigation indicates that drainage via infiltration methods is unlikely due to the low permeability clays and bedrock below the site. The actual strata below the site should be determined by intrusive investigation and the infiltration properties should be reviewed at this stage. For the purposes of this assessment the use of soakaway drainage has been discounted.

10.6 **Discharge to Watercourse:** The site is not crossed or adjacent to any watercourse. The nearest watercourse is approximately 160m to the south of the site. The site is within the catchment of Coal Pit Dike and the maintenance of a Greenfield run off rate for the new development will not exacerbate flooding downstream.

10.7 An outfall to the watercourse is the preferred outfall in accordance with the sustainable hierarchy within Building Regulations. The land between the site and the watercourse is owned by a third party, and there has been an approach to the landowner to lay a new sewer to the watercourse. Consent for the laying of a new sewer has not been granted and therefore an alternate route to the watercourse is the only option which can be considered.

10.8 **Discharge to Surface Water Sewer:** There are no suitable surface water sewers which could be utilised to discharge the site into in the immediate vicinity of the site. The sewer running along Chapel Lane is a combined Sewer. As a connection to the watercourse is required in accordance with the SuDS hierarchy it will be necessary to lay a new outfall sewer down Chapel Lane to the junction of Chapel Lane and High Street, where a connection can be made to the 450mm surface water sewer which discharges to the watercourse at a point approximately 40m to the south.

Yorkshire Water has been approached for consent to connect to this location and they have agreed to the connection onto the surface water sewer. A copy of an email received from YW is enclosed within appendix D.

10.9 **Discharge Rate:** In order to protect the downstream watercourse and River the discharge rate from the site should be set at the Greenfield rate in accordance with BMBC development control policy. The pre development Greenfield rate in accordance with BMBC development control policy is 21.4 l/s.

10.10 Maximum discharge rates should be maintained between the 1 in 1 year and 1 in 100 year events. An allowance of 30% should be made for climate change factors for the 1 in 100 year event as prescribed in the practice guide to PPS25.

10.11 New drainage should be designed to provide attenuation storage to flows in excess of the design discharge rate. Storage capacity should allow for flows within the network from the 1 in 30 year event without flooding. Flood water from the 1 in 100 year (plus climate change) event should be stored on site without increasing flood risk elsewhere, or if that is not possible due to site constraints, stored within the network. Due to the topography of the low corner of the site it is unlikely that substantial storage volume can be provided above ground and therefore the network should accommodate the maximum stored volume which is estimated to be 1735m^3.

10.12 Detailed design drawings by James Eaton are included within appendix F indicating the location and form of the storage on site and also the line of the outfall surface Water sewer down to the existing adopted surface water sewer in High Street. These details have been submitted to Yorkshire Water as part of a technical approval/section 104 application.

11 IMPACT OF DEVELOPMENT AND RESIDUAL RISK

11.1 A detailed Flood Risk Assessment and drainage management plan has been undertaken with respect to the planned development at Chapel Lane, Penistone. The FRA has been undertaken in accordance with EA, YW and BMBC development control guidance, and considers the setting of the development and likely impact on surrounding areas. A drainage strategy has been outlined in the report.

11.2 The development site has been identified as within flood zone 1. Residential development is **appropriate** within Flood Zone 1.

11.4 The assessment has identified the current site drainage characteristics in accordance with BMBC development control policy, and also established the current level of risk from flooding. A summary of the risks and mitigation identified is presented below:

Table 3826.7 - Summary of Main Issues

Issue	Summary	Risk
Flood zone	Flood Zone 1 Development proposed is compatible to the flood setting.	**Low**
Fluvial flooding	Low risk of flooding from Fluvial and Tidal sources	**Low**
Pluvial flooding	No significant risk of pluvial flooding noted.	**Low**
Overland Flooding	Overland flooding from land outside the site is considered a low risk due to relative site levels.	**Low**
Artificial Sources	No significant artificial sources known	**Low**
Flood Mitigation	Recommended discharge rate for surface water system to be a maximum of 5 l/s/ha in accordance with development control policy. Total discharge rate for site based on net development area equivalent to 21.4 l/s	**Low**
Surface Water Management	Maximum discharge rate to Coal Pit Dike to be restricted to 21.4 l/s and on site attenuation to be provided to store flows for up to the 1 in 100 year event (plus climate change). Outfall surface water sewer required down Chapel Lane to connect to existing surface water sewer which in turn discharges to Coal Pit Dyke.	**Low**

11.5 On the basis of the above report it is considered that the site can be designed to comply with relevant legislation, good practice and development control policy.