

Flood Risk Assessment

Land off Lairds Way, Penistone

For Yorkshire Land Ltd

By Curtins Ltd

June 2013

Revision A

Final

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Appendices

Appendix A - Plans-

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100 Year + cc Flood Areas
Surface Water Flooding

Revisions

Revision	Date	Description of Revision
/	10/06/13	First Issue
A	19/06/13	FINAL
B		
C		

1.0 Introduction

1.1 Project Background

- 1.1.1 Curtins Consulting has been appointed by Yorkshire Land Ltd to undertake a Flood Risk Assessment for the potential new development site located to the south of Lairds Way, Penistone. The FRA provides information on the nature of flood risk at the site and follows Government guidance with regards to development and flood risk.
- 1.1.2 The report is based on currently available information and preliminary discussions.
- 1.1.3 Proposals contained or forming part of this report represent the design intent and maybe subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.
- 1.1.4 Where the proposed works, to which this report refers, are undertaken more than twelve months following the issue of this report Curtins Consulting shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Curtins Consulting.

1.2 Scope of Flood Risk Assessment

- 1.2.1 The assessment is to be undertaken in accordance with the standing advice and requirements of the Environment Agency for Flood Risk Assessments as outlined in the Communities and Local Governments Technical Guidance to the National Planning Policy Framework (NPPF).
- 1.2.2 The assessment will:
 - Investigate all potential risks of flooding to the site;
 - Consider the impact the development may have elsewhere with regards to flooding; and
 - Consider outline design proposals to mitigate any potential risk of flooding determined to be present.
- 1.2.3 Following scrutiny of the Environment Agency flood maps it has been identified that the existing site lies within an area classified as Flood Zone 1, where the risk of flooding from rivers and sea is considered low. The site is approximately 0.5 hectares and therefore a Flood Risk Assessment is not required to support a planning application, however the main focus of this report will be on the management of surface water run-off.

1.3 Proposed Development

- 1.3.1 The proposed developments includes the construction of 14 No. houses, with associated landscaping and car parking areas located within the red line boundary on the existing site plan in Appendix A.

2.0 Existing Site Details

2.1 History and Current Use

- 2.1.1 The site is located approximately 750 metres east of the centre of Penistone with the M1 motorway a further 8 kilometres to the east as shown in figure 1. The site appears to have been previously developed but is currently unoccupied. The site is loosely bordered with an unoccupied site to the north of the site, unoccupied Greenfield land to the north-east; which is proposed to be redeveloped for housing, housing development to the east, a railway line along the south-west boundary with the railway station to the west of the site as shown in figure 2.

Figure 1: Site Location Plan



2.2 Existing Watercourse

- 2.2.1 The point on the site furthest north is approximately 110 metres south of the River Don with the majority of the site 170 metres south of the River.
- 2.2.2 The Scout Dyke and reservoir lies a further 2 kilometres to the north-west of the site.

2.0 Existing Site Details

2.2.3 Cubley Brook has been identified south of the proposed site; it is assumed that the watercourse enters into a culvert before ultimately discharging into the River Don. Presence of any culvert on site should be anticipated.

2.3 Existing Drainage

2.3.1 Existing drainage could be present on site, however nothing has been noted. Manholes have been identified within Lairds Way and there may be potential to connect proposed sewers into these manholes; subject to approval. It is also anticipated that there is likely to be existing sewers within Sheffield Road.

2.3.2 There is an existing housing estate which lies directly to the east of the proposed site, subject to approval it may be possible to utilise the existing drainage networks within this development.

2.3.3 No further sewers were observed in the vicinity of the proposed site.

2.4 Topography

2.4.1 A topographical survey has not been carried out on the site; the site appears to be relatively flat, however there is likely to be an elevation in land towards the south-west where the site is adjacent to the railway line. There is a strip of land within the proposed boundary which extends to Sheffield Road, this elevated from approximately 201m AOD up to 213m AOD where meets is the main area of the site. Lairds way is approximately 211m AOD at the proposed site entrance and slopes down towards Sheffield Road at a level of approximately 206m AOD.

Figure 2: Aerial Photograph



3.0 Development and Flood Risk

3.1 National Planning Policy Framework

- 3.1.1 In March 2012 the Department of Communities and Local Government published National Planning Policy framework document (NPPF) which provides technical guidance on how flood risk should be assessed during the planning and development process.

3.2 Table D1 (extract NFFP) Flood Zone Classifications

Zone 1 Low Probability

Definition

This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)

Appropriate Uses

All uses of land are appropriate in this zone

Zone 2 Medium Probability

Definition

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.

Appropriate uses

The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table D2

Zone 3a High Probability

Definition

This zone comprises land assessed as having a 1 in 100 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

Appropriate uses

The water compatible and less vulnerable uses of land in table D2. The highly vulnerable uses should not be permitted and more vulnerable and essential infrastructure should only be permitted if the Exception Test is passed. Essential infrastructure permitted should be designed and constructed to remain operation and safe for users in times of flood.

Zone 3b The Functional Flood Plain

Definition

This zone comprises land where water has to flow or be stored in times of flood. SFRA's should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability agreed between the LPA and EA, including water conveyance routes).

3.0 Development and Flood Risk

Appropriate uses

Only the water-compatible uses and essential infrastructure listed in table D2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in flood
- result in no loss of flood plain storage
- not impede water flows, and
- not increase flood risk elsewhere

Essential infrastructure in this zone should not pass the Exception Test.

3.3 Table D2 (extract NPPF) Flood Risk Vulnerability Classification

Essential Infrastructure

Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, e.g. primary substations and electricity generating power stations.

Highly Vulnerable

Police, Ambulance and Fire stations and command Centres and communications required during flooding.
Emergency dispersal points.

Basement dwellings, caravans, mobile homes and park homes for permanent residence.

Installations requiring hazardous substance consent.

More Vulnerable

Hospitals

Residential institutions

Buildings used for dwelling houses, student hall, hotels etc.

Non-residential for health services, nurseries and educational establishments

Landfill and sites used for waste management facilities or hazardous waste

Camping or caravans subject to specific warning and evacuation plan.

Less Vulnerable

Buildings used for shops, financial, professional and other services; restaurants, cafes, hot food takeaways, offices, general industry, storage and distribution, assembly and leisure.

Land and buildings for agriculture and forestry.

Waste treatment, except landfill and hazardous waste

Mineral working and processing (except sand and gravel working)

Water treatment plants and sewage treatment plants (if adequate pollution control measures are in place)

3.0 Development and Flood Risk

Figure 3: NPPF Flood Risk Zone compatibility

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗	✗

Key: ✓ Development is appropriate.
 ✗ Development should not be permitted.

3.4 Site Specific NPPF Flood Risk Categorisation

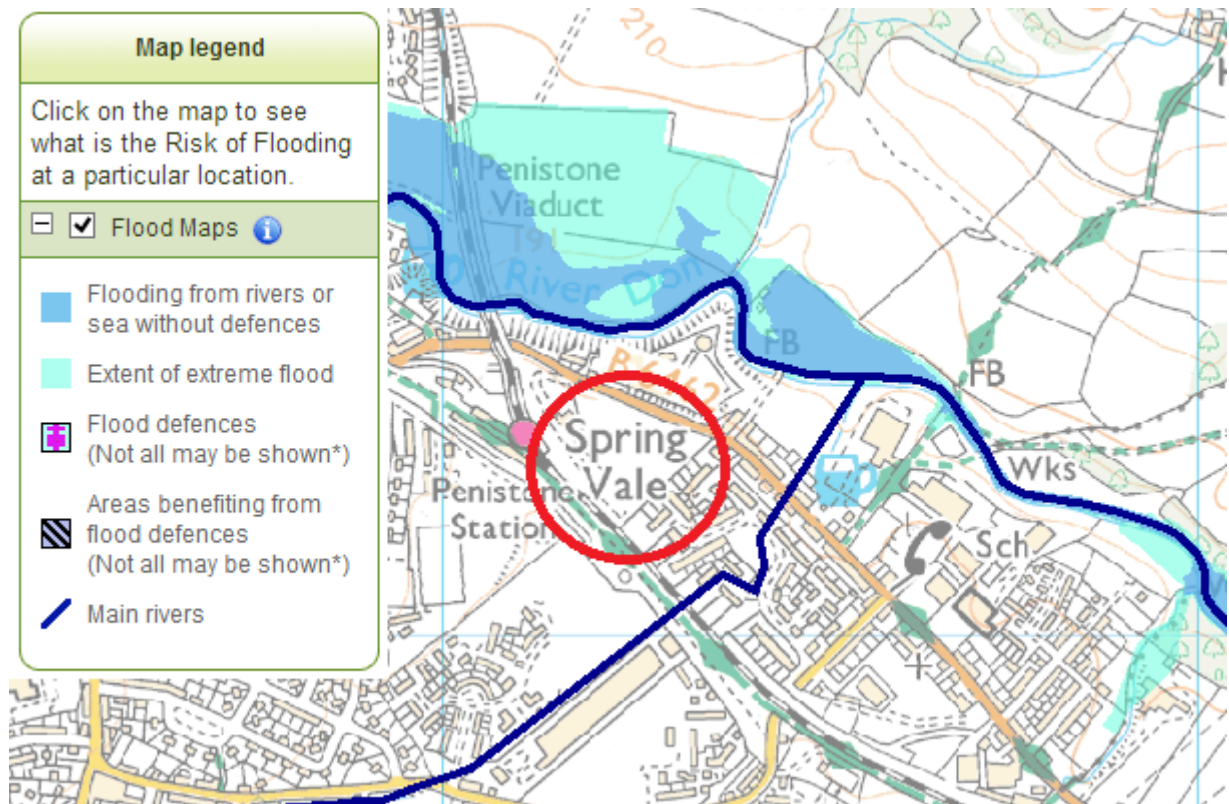
- 3.4.1 To assess the NPPF flood risk classification for the site the first step was to inspect the Environment Agency web based flood mapping data (Extract shown Figure 4). It can be seen from this data that the site (shown edged red) is clear of the blue and turquoise shaded sections noted on the drawing key and areas subject to either river or tidal flooding (blue; flood zone 3) or areas of extreme flooding (turquoise; flood zone 2).
- 3.4.2 Where a site is located in the white (unshaded) areas shown on the Environment Agency web based flood mapping, it is generally deemed to be classified as Zone 1.
- 3.4.3 Referring to table D1, Flood Zone Classifications from NPPF, this site comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%) and therefore all uses of land are appropriate in this zone.

3.5 Sequential and Exception Tests

- 3.5.1 As the site is located within a Flood Zone 1 area, the sequential and exception test are not required to be undertaken.

3.0 Development and Flood Risk

Figure 4 Environment Agency Flood Map

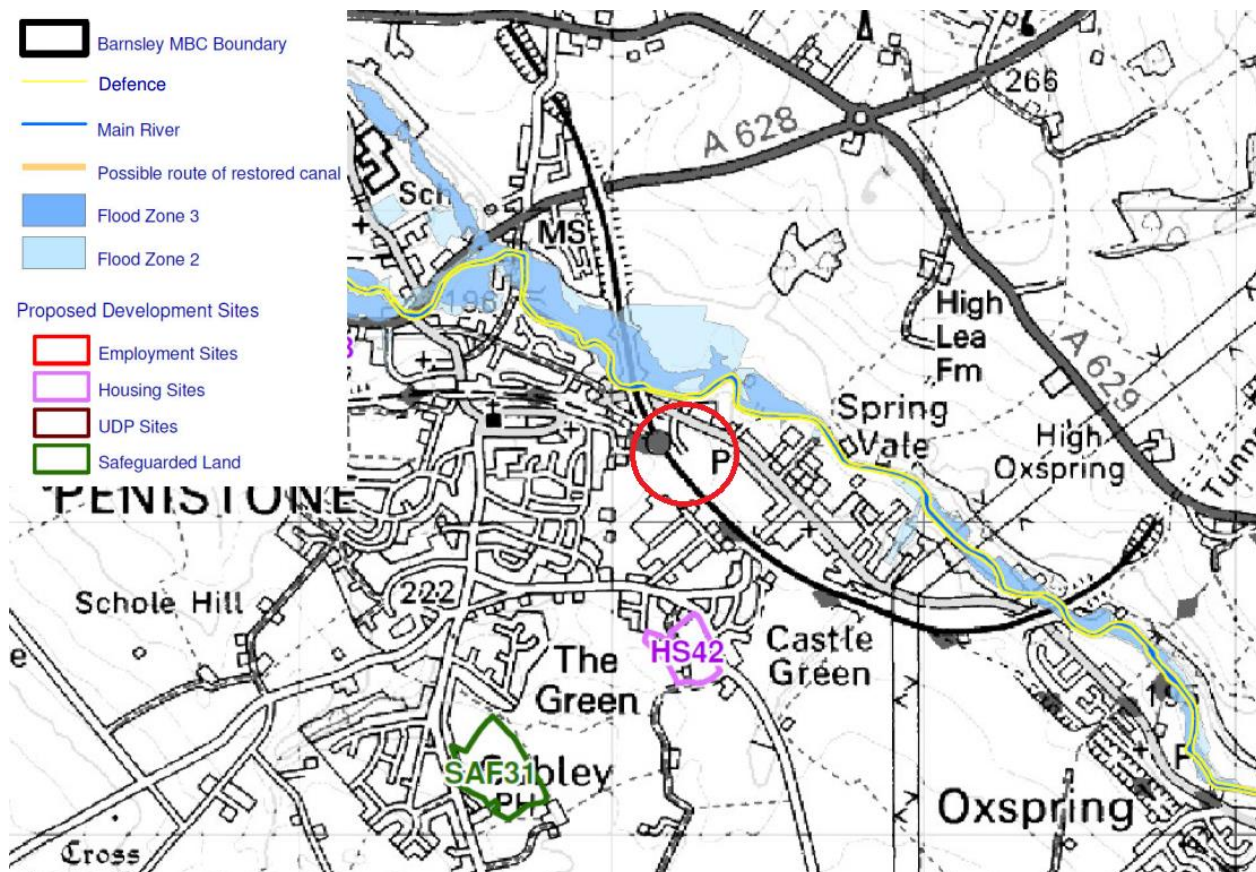


3.6 Strategic Flood Risk Assessment

- 3.6.1 A Strategic Flood Risk Assessment (SFRA) for Barnsley was carried out in September 2010 by JBA Consulting, which includes an assessment of flood risk in Penistone. The data and findings of the report have been used for this assessment.
- 3.6.2 Within the SFRA a map of the area has been produced indicating the extents of the different flood zones (shown in figure 5) this concurs with the Environment Agency Flood Map and shows the site to fall within Flood Zone 1 therefore all uses of land are appropriate in this zone.

3.0 Development and Flood Risk

Figure 5: SFRA Flood Map



4.0 Hydrological Assessment

4.1 Summary of Flood Risk

- 4.1.1 This study assesses the risk from different types of flooding to the development and the risk of flooding from the development, taking into consideration climate change, as well as how flood risks should be managed. The main types of flooding that may apply to the proposed development site are as follows: rising groundwater and surface water flooding (from sewers or overland flow). From the evidence collated and subsequent negotiations surface water flooding is considered to be the greatest flood risk to the proposed development. The approach to assessing Surface water flooding risk at the development site was informed by the requirements of NPPF in conjunction with the client and Environment Agency requirements.
- 4.1.2 A Strategic Flood Risk Assessment (SFRA) for Barnsley was carried out in September 2010 by JBA Consulting, which includes an assessment of flood risk in Penistone. The data and findings of the report have been used for this assessment.
- 4.1.3 Within the SFRA a map of the area has been produced indicating the extents of the different flood zones (shown in figure 5) this concurs with the Environment Agency Flood Map and shows the site to fall within Flood Zone 1. This is defined by NPPF guidance, as a zone of land assessed as having a less than 1 in 1000 annual probability of river or Sea flooding in any year (<0.1%).

4.2 Fluvial Flooding (Rivers and Streams)

- 4.2.1 The site is located approximately 110m-170m to the south of the River Don. There is currently no flood risk identified on the Environment Agency and SFRA flood maps for this area. With this in mind, the site is therefore regarded to be at low risk from fluvial flooding.

4.3 Tidal Flooding (Costal or Estuarine)

- 4.3.1 There is currently no flood risk from a tidal source identified on the Environment Agency and SFRA flood maps for this area. With this in mind the site is therefore regarded to be at low risk from tidal flooding.

4.4 Groundwater

- 4.4.1 The existing SFRA does not appear to highlight that Penistone suffers from areas of groundwater flooding, providing the site levels are not reduced and there are no proposed basements; the site is regarded to be at low risk from groundwater flooding.

4.5 Sewers or highway drains

- 4.5.1 The sewers and drains adjacent to the site in Sheffield Road are likely to be public sewers maintained by Yorkshire Water or Highway Drainage maintained by Barnsley Council, therefore risk from sewer flooding is low.

4.0 Hydrological Assessment

4.6 Surface Water Flooding to the site

- 4.6.1 Surface water sewers are at risk of surcharging during extreme rainfall events with flooding occurring principally from manholes and gullies. Surcharging sewers can result in overland flow which if originating at a higher elevation than a development site can potentially pose a flood risk.
- 4.6.2 Following my investigation I was not able to find any reports of surcharging in the vicinity of the proposed site, refer to the surface water flood map enclosed in Appendix A. Flooding risk from surface water is therefore considered low.

4.7 Surface Water Flooding from the site

- 4.7.1 Developers are responsible for ensuring that new development does not increase the flood risk elsewhere. The proposed surface water drainage network shall be designed to not flood for a 1 in 30 year storm event plus climate change and flood water generated from a 1 in 100 year plus climate change rainfall event shall be constrained within areas on site so not to cause damage to buildings, essential services or adjoining developments and services.
- 4.7.2 The development site is currently unoccupied therefore development has the potential to increase flood risk where additional hard surfaces are introduced for example roads, car parks, building roofs and temporary site accommodation.
- 4.7.3 A detailed assessment of the proposed surface flows is carried out within the drainage strategy within section 6 of this report.

4.8 Infrastructure failure

- 4.8.1 As previously stated, the public sewer network is maintained by Yorkshire Water so risk is low. The site can be regarded as low risk from all primary and secondary flood mechanisms as required to be investigated by PPS 25 (and as now superseded by NPPF).
- 4.8.2 As noted above the total site area has been estimated to be 0.5 hectares. Therefore, as the site is located within a Zone 1 low risk flood area and the site is less than 1 hectare, it can be considered that a full NPPF flood risk assessment is not required to accompany a planning submission for the new development.

5.0 Mitigation

5.1 Fluvial Flooding Mitigation

- 5.1.1 The development site lies within Flood Zone 1 and therefore there is low risk of fluvial flooding.
- 5.1.2 Any new building levels should not be designed lower than existing ground levels to ensure that sites flood zone classification remains.

5.2 Groundwater Flooding Mitigation

- 5.2.1 Groundwater flooding tends to be more persistent than other sources of flooding, typically lasting for weeks or months rather than hours or days. Groundwater flooding does not generally pose a significant risk to life due to the slow rate at which the water level rises; however, it can cause significant risk to property.
- 5.2.2 Although the prospect of groundwater flooding to the site is considered low, as a precaution it is recommended that close monitoring of groundwater levels around the site should be undertaken to ensure that finished floor levels are sufficiently raised above the water table.

5.3 Surface Water Flooding to the Site Mitigation

- 5.3.1 From analyzing the topographical survey, it has been assumed the majority of runoff from the surrounding infrastructure will be directed into the existing drainage network before it has the opportunity to impact on the existing site.
- 5.3.2 Flooding risk to the development site from the surrounding areas is therefore considered low.

5.4 Surface Water Flooding from the Site Mitigation

- 5.4.1 Any new development site drainage should be designed in accordance with current best practice to provide adequate capacity not to flood for a 1 in 30 year storm event and flood water generated from a 1 in 100 year plus climate change storm event shall be constrained within the areas on site so not to cause damage to buildings, essential services or adjoining developments and services. Peak flows should be restricted to Greenfield run-off rates, and agreed with Yorkshire Water with adequate attenuation provided to keep the stored volume of surface water safely on the site.
- 5.4.2 Assuming the existing sewers will be maintained by their adopted authority, it can be assumed risk of flood from blockage or overloading is minimal.
- 5.4.3 To minimise localised flooding within the site the drainage design should ensure that gullies, drainage channels and drains are all suitably sized to accommodate peak storm flows. Also, all inlet features should have suitably sized sumps to catch silts and should be subject to a documented routine maintenance and cleansing regime.
- 5.4.4 Flows from the new development are to be retained on site and discharged at Greenfield run-off rate and agreed with Yorkshire Water.

5.0 Mitigation

5.4.5 Flooding risk from the development site to the surrounding areas is therefore considered low.

5.5 Cumulative Sites Impact

5.5.1 The unoccupied Greenfield land to the north-east of the site is proposed to be redeveloped as housing for Co-operative Estates; therefore impact from the Co-operative site to the Yorkshire Land site and from the Yorkshire Land site to the Co-operative site has been considered specifically.

5.5.2 The Co-operative site topography falls towards Sheffield Road and therefore overland flows from this site should have no impact on the Yorkshire Land site. Any increase in impermeable areas on the Co-operative site should be discharged to the appropriate drainage system at an approved discharge rate.

5.5.3 Flooding risk to the Yorkshire Land site from the Co-operative site is therefore considered low.

5.5.4 The Yorkshire Land development proposals include a restriction in surface water run-off rates to Greenfield run-off and therefore should have no impact on the downstream drainage network. Surface water will be directed into the proposed drainage network before it has the opportunity to impact on the Co-operative site.

5.5.5 Flooding risk to the Co-operative site from the Yorkshire Land site is therefore considered low.

- 6.1.1 The proposed foul water network is to connect into the existing combined or foul public sewer system at a convenient location off site. Existing sewers are likely to be located within Laird Way or Sheffield Road.
- 6.1.2 In following the standard hierarchy of drainage solutions, consideration should firstly be given to the discharge of surface water runoff by sustainable methods such as infiltration. If the ground conditions encountered in the site investigation report indicate that ground conditions are unlikely to support the use of Sustainable Urban Drainage Systems (SUDS) alternative methods should be used.
- 6.1.3 The proposed drainage networks should be designed to restrict and attenuate for the Greenfield run-off rates using a flow control. The Greenfield run-off has been calculated in figure 7 and is less than 5 l/s; a minimum outlet throttle of 100mm should be used for the discharge off site to avoid blockages within the pipe network and this would usually allow approximately 5 l/s into the downstream network. Therefore a discharge of 5 l/s has been assumed.

Bishopsgate Manchester M2 3WQ		
Date 07/06/2013 15:53 File	Designed by grimsley_c Checked by	
Micro Drainage	Source Control 2013.1	

ICP SUDS Mean Annual Flood

Input			
Return Period (years)	2	Soil	0.300
Area (ha)	0.500	Urban	0.000
SAAR (mm)	967	Region Number	Region 3

Results 1/s

QBAR Rural	1.3
QBAR Urban	1.3
Q2 years	1.3
Q1 year	1.1
Q30 years	2.3
Q100 years	2.8

- 6.1.4 The proposed surface water drainage network shall be designed to not flood for a 1 in 30 year storm event plus climate change and flood water generated from a 1 in 100 year plus climate change rainfall event shall be constrained within areas on site so not to cause damage to buildings, essential services or adjoining developments and services.
- 6.1.5 Attenuation will be required in the system and will be provided within the pipe networks, manholes and attenuation feature such as cellular storage.
- 6.1.6 Based on an approximate impermeable area of 75% of the site, the approximate attenuation required will be between 152m³ and 224m³ as shown in Figure 8.

6.0 Drainage Impact Assessment

Figure 8: Attenuation Volumes for up to the 1 in 100 year + climate change

The 'Quick Storage Estimate' dialog box in Micro Drainage software is shown with the 'Variables' tab selected. The left sidebar contains buttons for 'Variables', 'Results', 'Design', 'Overview 2D', 'Overview 3D', and 'Vt'. The main area contains the following fields:

Variable	Value
FSR Rainfall	100
Return Period (years)	100
Region	England and Wales
Map	M5-60 (mm)
Ratio R	0.339
Cv (Summer)	0.750
Cv (Winter)	0.840
Impervious Area (ha)	0.375
Maximum Allowable Discharge (l/s)	5.0
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	20

Buttons at the bottom: Analyse, OK, Cancel, Help. A note at the bottom states: 'Enter Climate Change between -100 and 600'.

The 'Quick Storage Estimate' dialog box in Micro Drainage software is shown with the 'Results' tab selected. The left sidebar contains buttons for 'Variables', 'Results', 'Design', 'Overview 2D', 'Overview 3D', and 'Vt'. The main area displays the following text:

Global Variables require approximate storage of between 152 m³ and 224 m³.

These values are estimates only and should not be used for design purposes.

Buttons at the bottom: Analyse, OK, Cancel, Help. A note at the bottom states: 'Enter Climate Change between -100 and 600'.

- 6.1.7 With this restriction in surface water flows into the existing drainage network it is understood that this will not add to any future impact on the wider sewer network, and with this in mind the potential of future flooding from the site is considered to be low.
- 6.1.8 The final design of the storm water network needs to be in accordance with legislation set by the Environment Agency, Barnsley Council and Yorkshire Water.

7.0 Conclusions and Recommendations

7.1 Conclusion and Recommendations

- A Flood Risk Assessment has been conducted for the proposed development site located to the south of Sheffield Road and Lairds Way, Penistone. The FRA has been conducted in accordance with the requirements of NPPF.
- The EA flood map shows the development site in Flood Zone 1. An SFRA was carried out in September 2010 and also shows the development to lie in Flood Zone 1.
- SUDS should be incorporated into the design wherever possible.
- Building Levels should be set no lower than the existing site levels to ensure the site remains as a flood zone 1 area.
- A pathway for flood water should be created working with the existing site levels to allow free passage of any overland flows through the site, located to avoid building and other important structures.
- Any existing drainage to be utilised within the existing development should be thoroughly checked for line blockages and collapses and any defects are to be corrected accordingly.
- The final design of the drainage networks shall be in accordance with the legislation set by the Environment Agency, Barnsley Council and Yorkshire Water.
- A suitable maintenance strategy should be provided to ensure the drainage network is cleaned regularly.

Therefore, if the principles set out within the previous sections of this report are followed and developed at detailed design stage by the design engineer, the site can be considered:

- To have a low probability of suffering from any form of flooding
- To be proved as not increasing the probability of flood risk to other properties within the local catchment area.

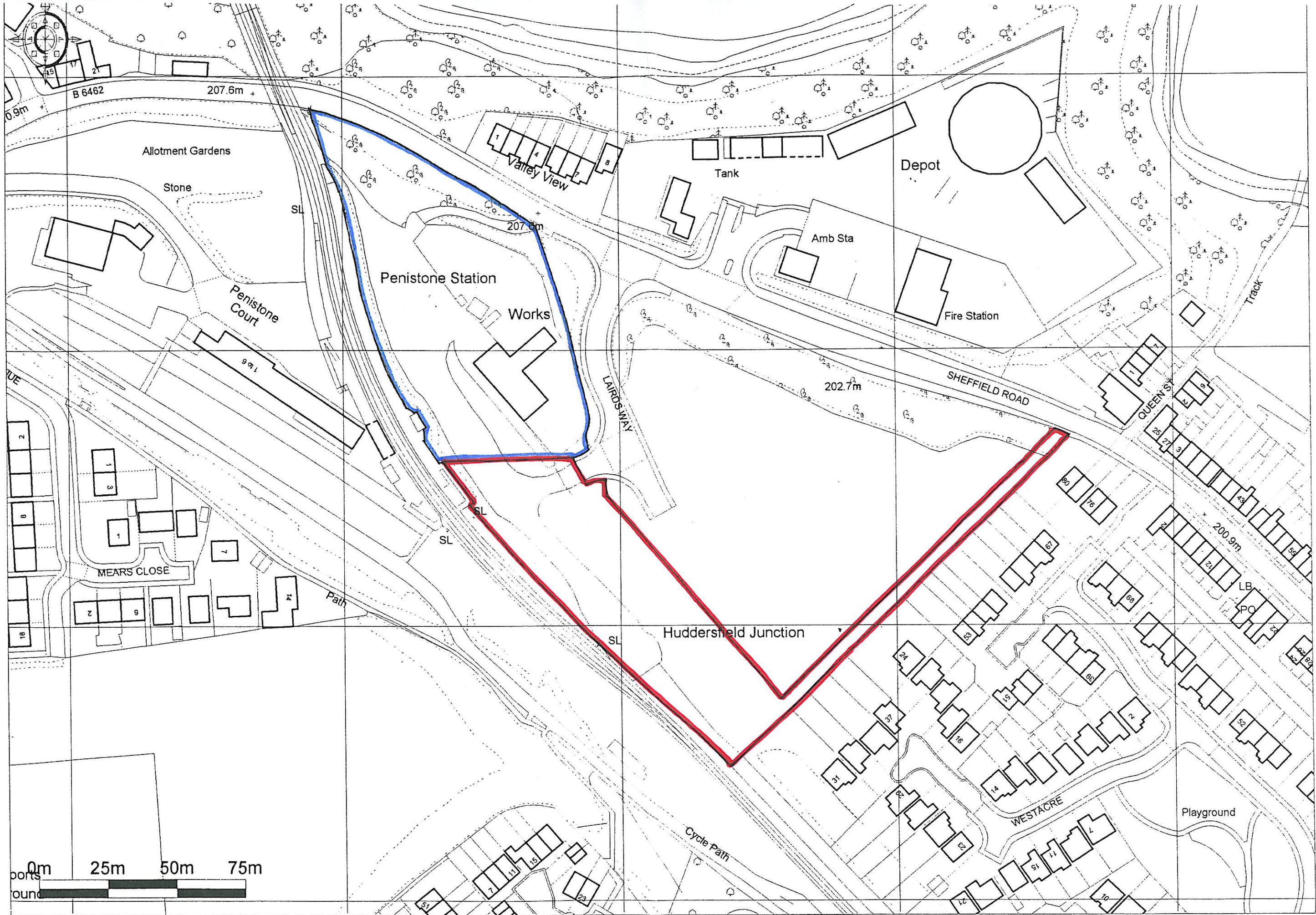
Appendix A

Site Plan

Existing Site Plan

100 Year + cc Flood Areas

Surface Water Flooding



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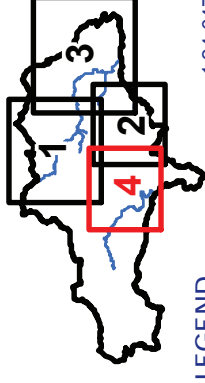


NB: SCALE 1:1250

(ENLARGED FROM 1:2500)

Peter Dimberline RIBA

KEYPLAN



LEGEND

1:24,647



Note:
Please see Section 5.8 of the SFRA
for further details.

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MAP C - 4

PLUVIAL FLOODING CAUSED BY
100YEAR RAINSTORM

