Weetwood

Development • Planning • Environment

LAND AT DEARNE HALL ROAD, LOW BARUGH

FLOOD RISK AND DRAINAGE ASSESSMENT

Final Report v1.3

March 2013

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1 INTRODUCTION

Weetwood has been instructed by Hallam Land Management & Commercial Estates Projects to undertake a Flood Risk Assessment (FRA) for the proposed development of a site located at Low Barugh near Barnsley, in accordance with the requirements of the National Planning Policy Framework (NPPF) and its supporting Technical Guidance.

1.1 SITE LOCATION

The site is located at Ordnance Survey National Grid Reference SE 317 087, as shown in **Figure 1**.

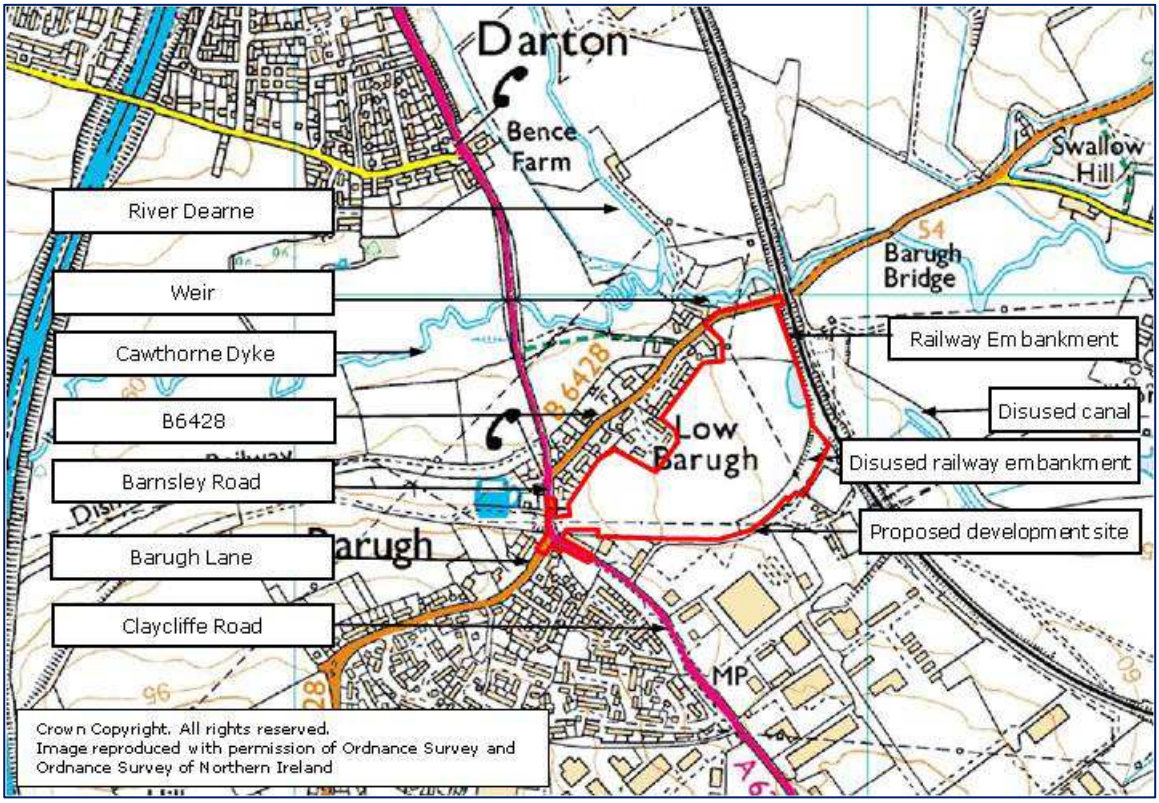


Figure 1: Site Location

The site lies south of two watercourses, the River Dearne and Cawthorne Dyke. The River Dearne and Cawthorne Dyke merge and flow in an easterly direction approximately 100m to the north of the site

1.2 EXISTING AND PROPOSED DEVELOPMENT

The site comprises approximately 10 hectares (ha) of undeveloped land on the outskirts of Barugh. A pond is located in the northeast corner of the site. The site is bounded by residential development to the northwest, with industrial development to the south (the South Yorkshire (Redbrook) Industrial Estate), a functional railway embankment to the east and a disused railway embankment to the southeast (**Figure 2**).



Figure 2: Looking west over site from top of disused embankment

Proposals are for residential development of approximately 150 dwellings with associated access roads as well as dedicated public open space (**Appendix A**).

The proposals for residential use are classified as *'more vulnerable development'* and amenity open space is classified as *'water-compatible development'* in Table 2 of the NPPF Technical Guidance

1.3 SITE LEVELS

A topographic survey of the site has been undertaken and is provided in **Appendix B**. Site levels in the proposed development area are shown to be in the region of 56.99 to 72.71 metres Above Ordnance Datum (m AOD).

Levels to the east of the site in which public open space is proposed are in the region of 54.80 to 57.96m AOD.

Levels obtained from the survey have been utilised to develop a digital terrain model as illustrated in **Figure 3**. This demonstrates that the site rises from north east to south west.

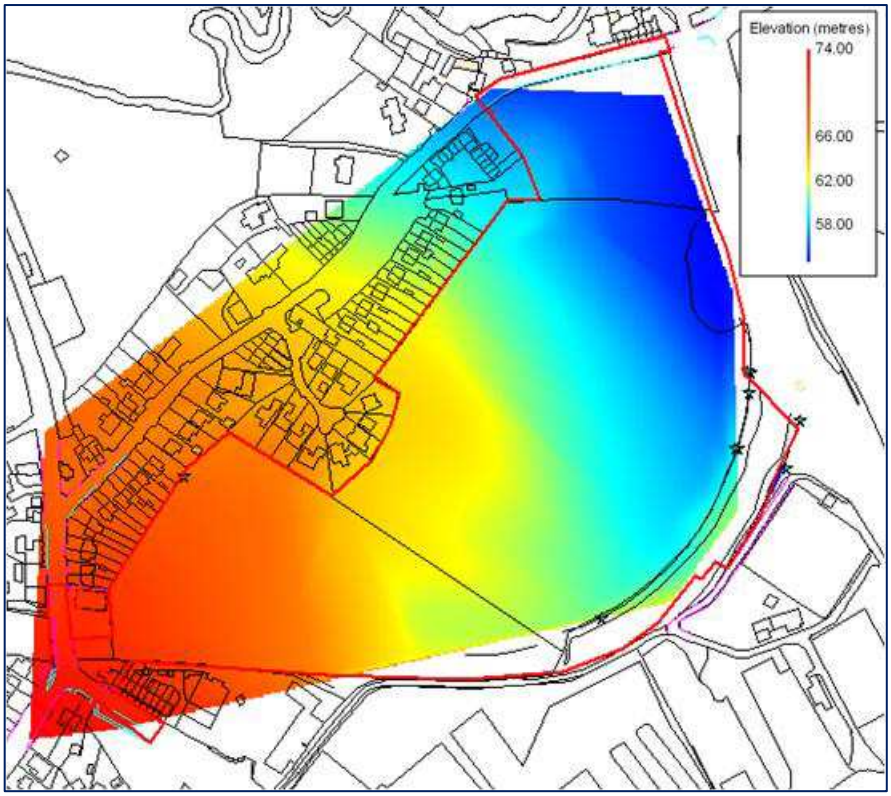


Figure 3: Digital Terrain Model

1.4 ACCESS AND EGRESS

Access to the site is currently provided via Barnsley Road (which becomes Claycliffe Road after the junction with Barugh Lane) to the west of the site. Levels along this route are shown to be in the region of 72.97 and 67.82m AOD with the highest point being near to the junction with Barugh Lane.

Access to the site will continue to be provided via Barnsley Road and a new access point will be created off the B6428 to the north of the site. Levels along this route are shown to be in the region of 55.25 to 56.42m AOD.

2 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The aim of the NPPF and its supporting Technical Guidance is to ensure that flood risk is taken into account at all stages in the planning process and is appropriately addressed.

2.1 FLOOD ZONE DESIGNATION

Table 1 of the NPPF provides the definitions for each of the flood zones, which are summarised as follows:

- **Flood Zone 1: Low Probability.** Land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year.
- **Flood Zone 2: Medium Probability**. 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 probability of flooding from the sea in any year.
- **Flood Zone 3a: High Probability.** 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.
- **Flood Zone 3b: The Functional Floodplain.** Land where water has to flow or be stored in times of flood. The identification of the functional floodplain should take account of local circumstance and not be defined solely on rigid probability parameters. However, land which would flood with an annual probability of 1 in 20 or greater in any year should provide a starting point for consideration and discussion.

2.1.1 Environment Agency Flood Map

According to the Environment Agency (EA) Flood Map (**Figure 4**) the majority of the site is located in Flood Zone 1; however a small area to the northeast is located within Flood Zone 2.

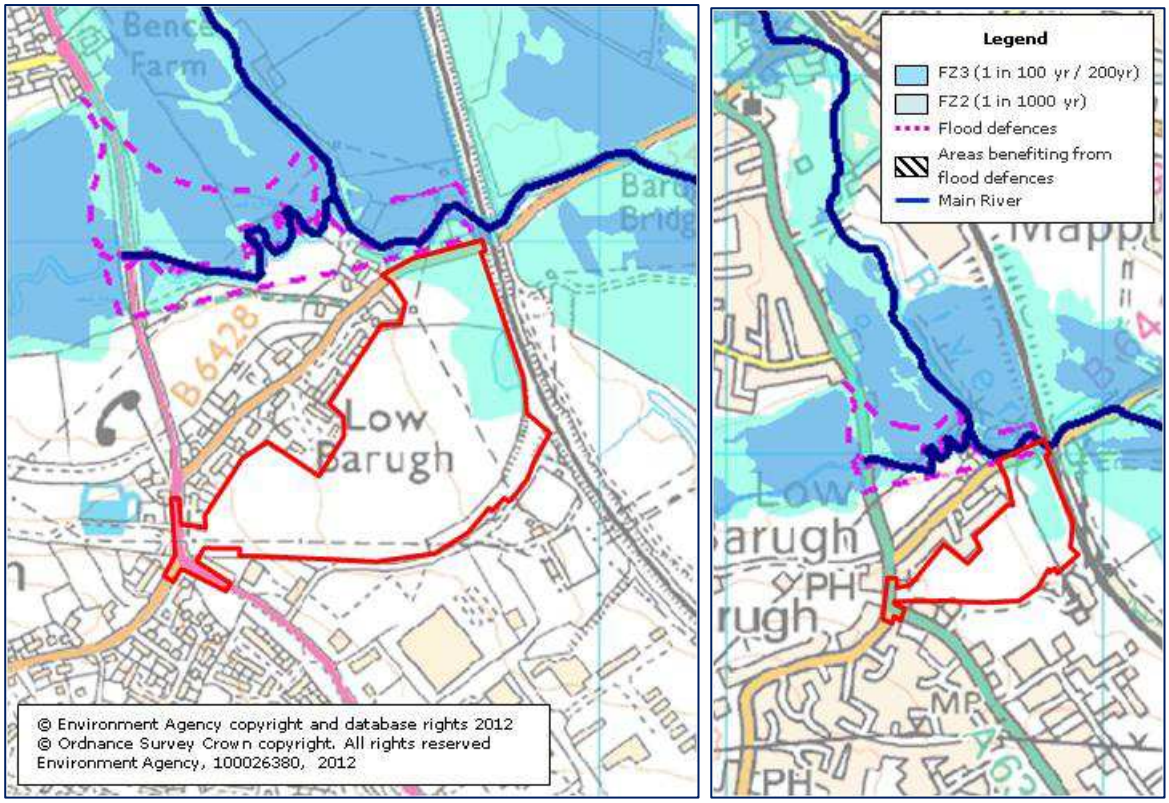


Figure 4: Environment Agency Flood Map

(Source: Environment Agency website)

2.1.2 Strategic Flood Risk Assessment

A SFRA was published by Barnsley Council in September 2010.

Map A-1 of the SFRA indicates the entire site lies within Flood Zone 1.

2.2 SEQUENTIAL TEST

The aim of the Sequential Test (as outlined in Chapter 10 of the NPPF and paragraphs 3-5 of the Technical Guidance) is to encourage development to be located in areas at the lowest probability of flooding.

It is proposed to locate all residential buildings within the Flood Zone 1 developable area of the site. The proposed development is therefore considered to satisfy the requirements of the Sequential Test.

3 FLOOD RISK

3.1 HISTORICAL RECORDS OF FLOODING

The EA has provided a flood map illustrating historic flood events within the vicinity of the site (**Figure 5**).

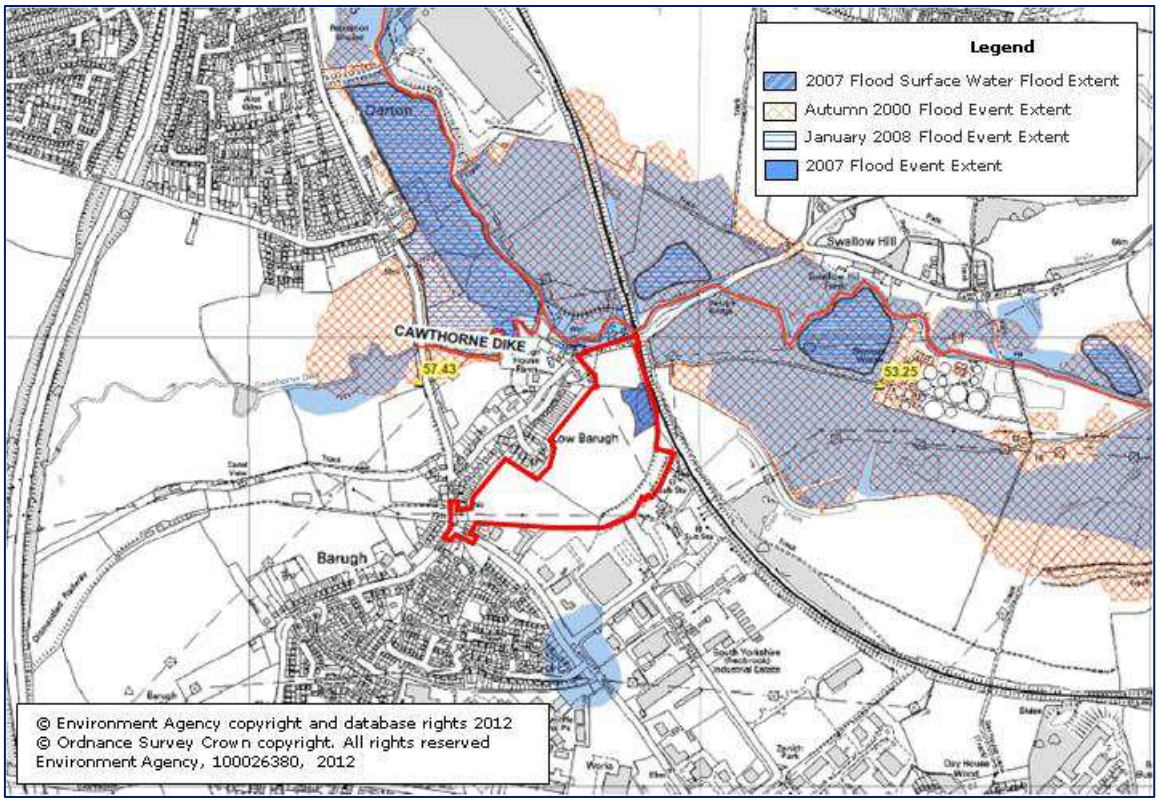


Figure 5: Environment Agency Historic Flood Events Map

This shows that during 2007 a small area of surface water flooding occurred to the east of the site, at the location of an existing small pond. The measured water level and return period of this event is not known. The site remained dry during all other recorded flood events.

The British Hydrological Society (BHS) Chronology[1] does not list any records of flooding at Low Barugh[2]

3.2 FLUVIAL - CAWTHORNE DIKE & RIVER DEARNE

The River Dearne flows in a southerly direction before heading east approximately 100m to the north of the site and flowing under a railway bridge. Cawthorne Dike flows in an easterly direction before discharging into the River Dearne upstream of the railway bridge.

[1] British Hydrological Society Chronology www.dundee.ac.uk/geography/cbhe/

[2] Based on keyword searches of 'Barugh', *'Barugh Green'* and *'Barnsley'*

3.2.1 Modelled Flood Levels

Modelled flood levels for the River Dearne and Cawthorne Dike have been obtained from the EA for the 1 in 25 year, 1 in 100 year, 1 in 100 year plus climate change and 1 in 1000 year flood events.

The flood levels derived for the modelled nodes illustrated on **Figure 6** are provided in **Table 1** (*The cells highlighted in light blue indicate the modelled nodes situated adjacent to the site.*

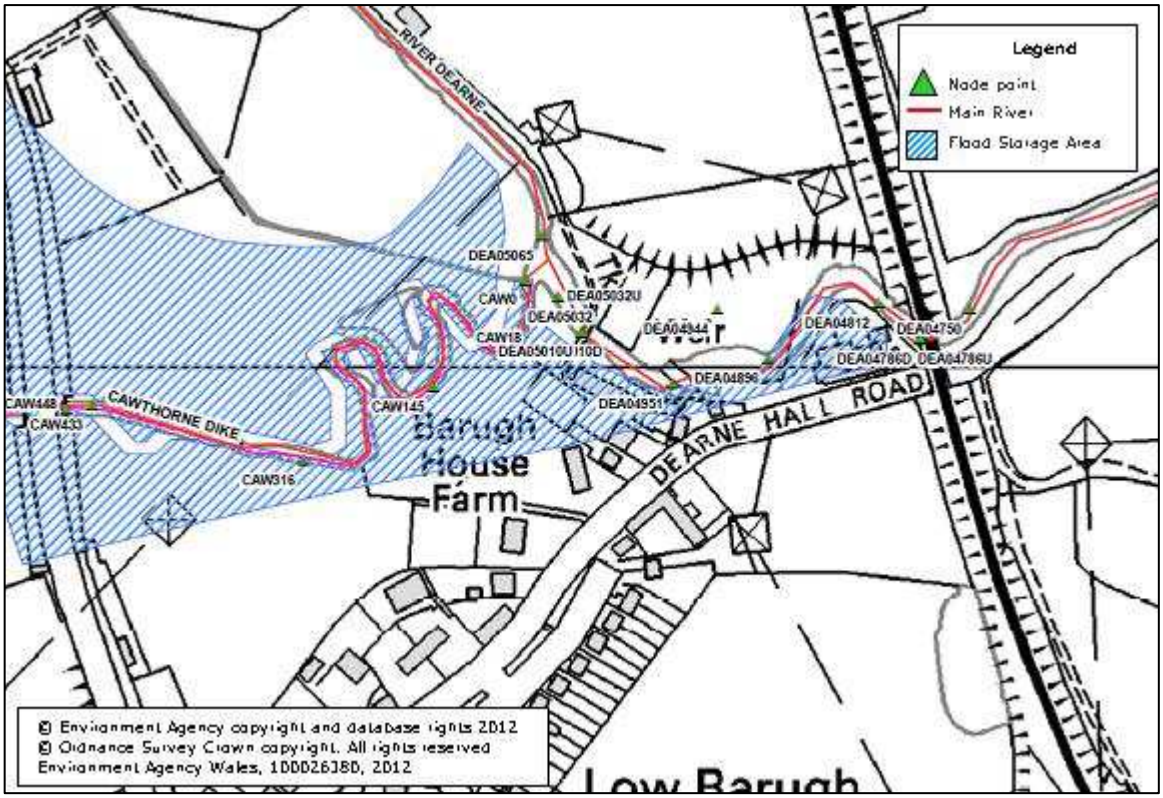


Figure 6: Cawthorne Dike & River Dearne Modelled Node Locations

(Source: Upper Dearne Flood Risk Mapping Study)

Table 1: Cawthorne Dike & River Dearne Modelled Flood Levels

Node	Water Levels (m AOD)			
	1 in 25yr	1 in 100yr	1 in 100yr plus cc	1 in 1000yr
CAW448	*56.60*	*56.72*	*56.76*	*57.00*
CAW433	*56.61*	*56.76*	*56.84*	*57.18*
CAW316	*56.50*	*56.63*	*56.69*	*57.09*
CAW145	*56.17*	*56.40*	*56.56*	*57.14*
CAW18	*55.82*	*56.08*	*56.29*	*57.00*
CAW0	*55.88*	*56.14*	*56.33*	*56.98*
DEA05032U	*55.88*	*56.14*	*56.33*	*56.98*
DEA05032	*55.88*	*56.14*	*56.33*	*56.98*
DEA05010U	*55.66*	*55.71*	*55.72*	*56.65*
DEA05010D	*55.66*	*55.71*	*55.72*	*56.47*
DEA04951	*55.73*	*55.88*	*55.98*	*56.55*
DEA04944	*54.89*	*55.52*	*55.81*	*56.48*
DEA04896	*54.81*	*55.48*	*55.77*	*56.47*
DEA04812	*54.46*	*55.09*	*55.40*	*56.09*
DEA04786U	*54.52*	*55.16*	*55.46*	*56.13*
DEA04786D	*54.47*	*55.09*	*55.37*	*55.98*

With site levels of the proposed development area in the region of 56.99 to 72.71m AOD, no flooding is expected in up to the 1 in 1000 year event.

The levels shown in **Table 1** indicate some flooding of the north-eastern part of the site in all modelled events which contradicts the information provided in the EA flood map. Irrespective, no development is proposed in this area.

Any residual risk of flooding will be mitigated though the implementation of the measures proposed in **Section 4** of this report

3.3 POND

There is a pond located in the north east corner of the site. This pond is likely to form an integral part of the local surface water drainage regime, and is therefore considered in more detail in **Section 5**.

3.4 SURFACE WATER DRAIN

A surface water drain or watercourse was identified to the south east of the site during a site visit. This drain runs from the eastern border of the site under the main railway embankment. According to old maps, a watercourse ran from west to east across the area currently occupied by the industrial estate to the south of the proposed development site. The course of the watercourse appears to have been diverted and culverted. The open section identified to the southeast of the site lies on the far side of the disused railway embankment forming the raised eastern border of the site and it is therefore unlikely to pose a significant flood risk to the site. However, surcharging of culvert manholes further upstream could potentially pose some risk.

Any residual risk of flooding will be mitigated though the implementation of the measures proposed in **Section 4** of this report

3.5 RESERVOIRS, CANALS AND OTHER ARTIFICIAL SOURCES

Reservoir or canal flooding may occur as a result of the facility being overwhelmed and/or as a result of dam or bank failure. There are no canals located within the immediate vicinity of the site. The EA Risk of Flooding from Reservoirs Map indicates that the site is not at risk of flooding from artificial impoundments (**Figure 7**).

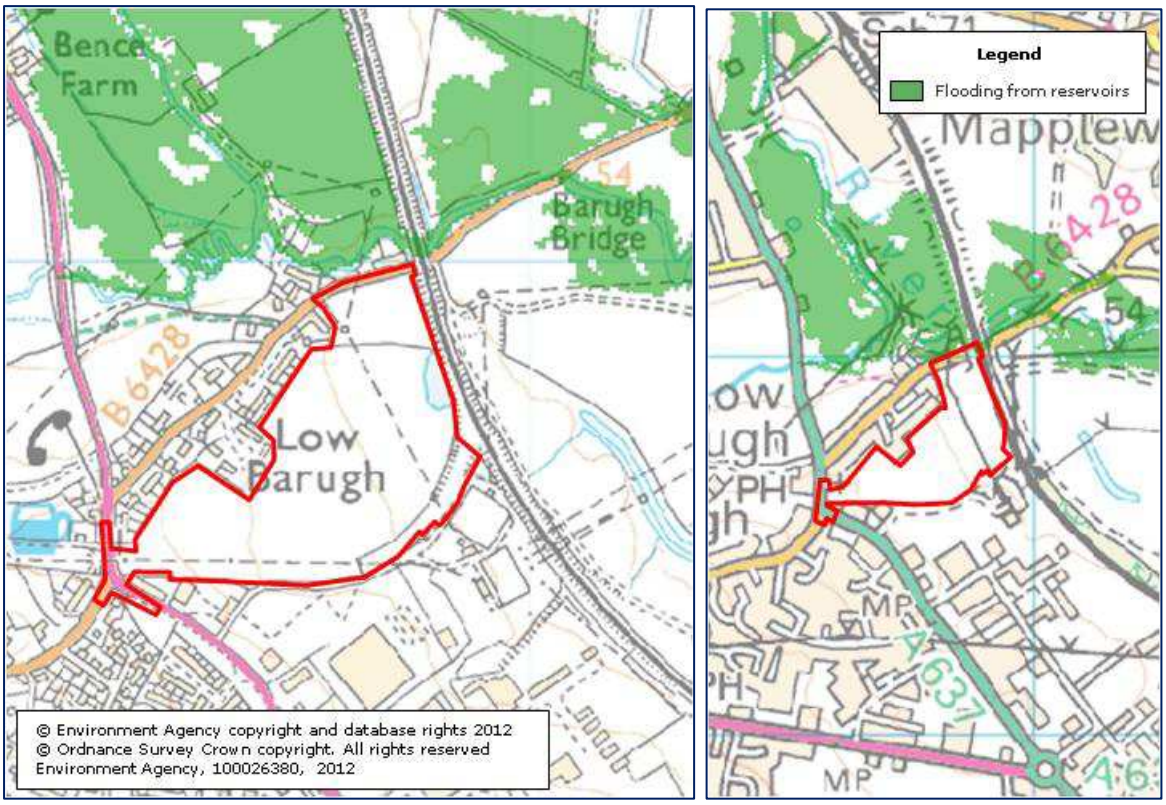


Figure 7: Environment Agency Risk of Flooding from Reservoirs Map

(Source: Environment Agency website)

3.6 GROUNDWATER

Groundwater flooding generally occurs during intense, long-duration rainfall events, when infiltration of rainwater into the ground raises the level of the water table until it exceeds ground levels. It is most common in low-lying areas overlain by permeable soils and permeable geology, or in areas with a naturally high water table.

According to the Soilscapes maps produced by the National Soils Research Institute[3], the site could potentially be underlain by two very different soil types:

- *Naturally wet, loamy and clayey floodplain soils with high groundwater*

[3] Soilscapes www.landis.org.uk/soilscapes/

- *Freely draining acid loamy soils*

According to the British Geological Survey (BGS) Groundwater Flooding Hazard map (**Figure 8**) the susceptibility to groundwater flooding is low to moderate

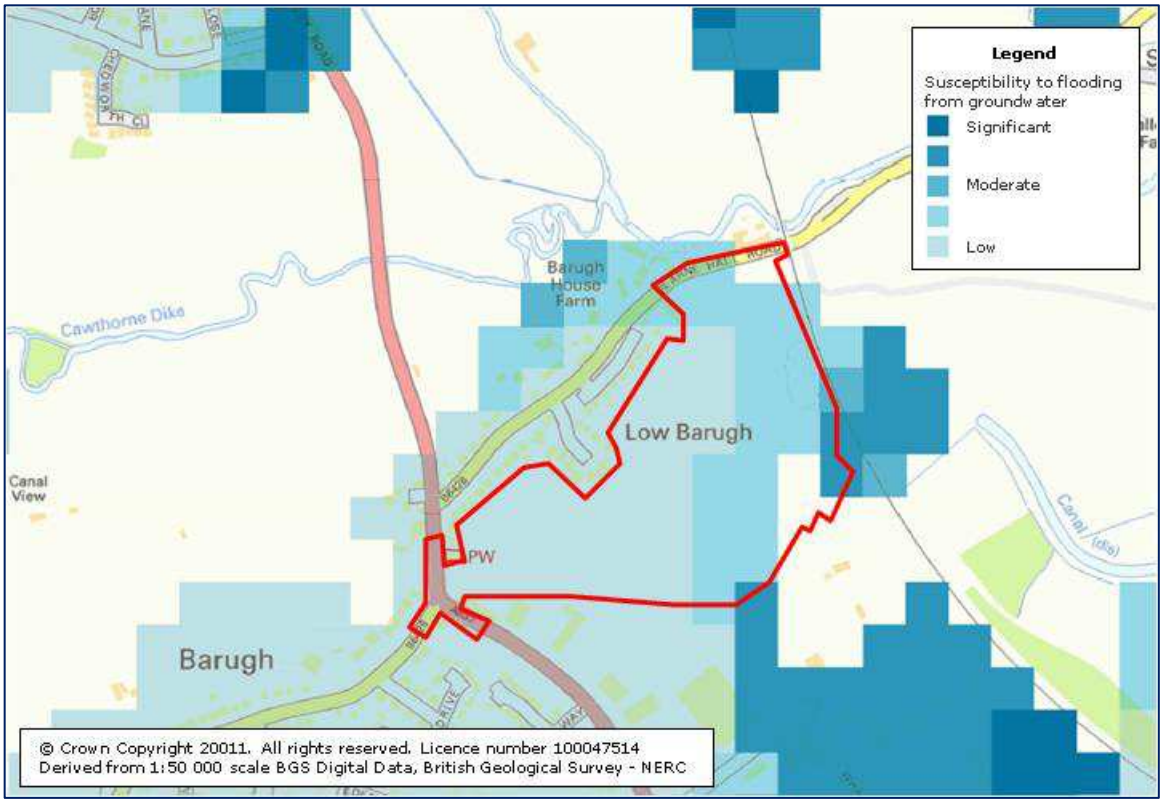


Figure 8: BGS Groundwater Flooding Hazard Map

(Source: Findmaps)

The residual risk of flooding from this source will be mitigated through the implementation of the measures proposed in **Section 4** of this report.

3.7 SURFACE WATER

Surface water flooding comprises pluvial, sewer and highway drains and gullies.

3.7.1 Pluvial

Pluvial flooding results from rainfall-generated overland flow, before the runoff enters any watercourse or sewer, or where the sewerage/drainage systems and watercourses are overwhelmed and therefore unable to accept surface water. Pluvial flooding is usually associated with high intensity rainfall events but may also occur with lower intensity rainfall where the ground is saturated, developed or otherwise has low permeability resulting in overland flow and ponding within depressions in the topography.

As detailed previously, according to the Soilscapes maps, there are potentially two soil conditions underlying the site; however it is most likely that drainage is impeded on site, evidenced by the presence of a pond, wetland area and standing water. There may therefore be the propensity for some accumulation of surface water; however any residual concern regarding flood risk from this source will be addressed through the mitigation measures as detailed in **Section 4** and the surface water drainage strategy in **Section 5**.

3.7.2 Sewer

Sewer flooding can occur when the capacity of the sewer system is overwhelmed by heavy rainfall, becomes blocked or is of inadequate capacity, resulting in flooding of land and/or property. Normal discharge of sewers and drains through outfalls may be impeded by high water levels in receiving waters.

Yorkshire Water has been consulted to ascertain whether it holds any records of sewer flooding at the site. A response was received[4] which states their records, *'do not show any sewer flooding within this vicinity'.*

3.7.3 Highway Drains and Gullies

Barnsley Council has been consulted to ascertain whether it holds any records of highways flooding at or within the vicinity of the site. A response is awaited.

[4] Email from B Mcbride (Yorkshire Water) to H Ellis (Weetwood) 29 May 2012

4 MITIGATION MEASURES

4.1 FLOOD MITIGATION

Any residual risk of flooding from the existing pond to the north east of the site, pluvial flooding and groundwater flooding will be mitigated though the implementation of the measures proposed within the following section of this report.

4.1.1 Development Zones

The development platform for residential dwellings, shown on the draft land use plan (**Appendix A**) will be located to the west and south of the site in Flood Zone 1 (see **Figure 9**).

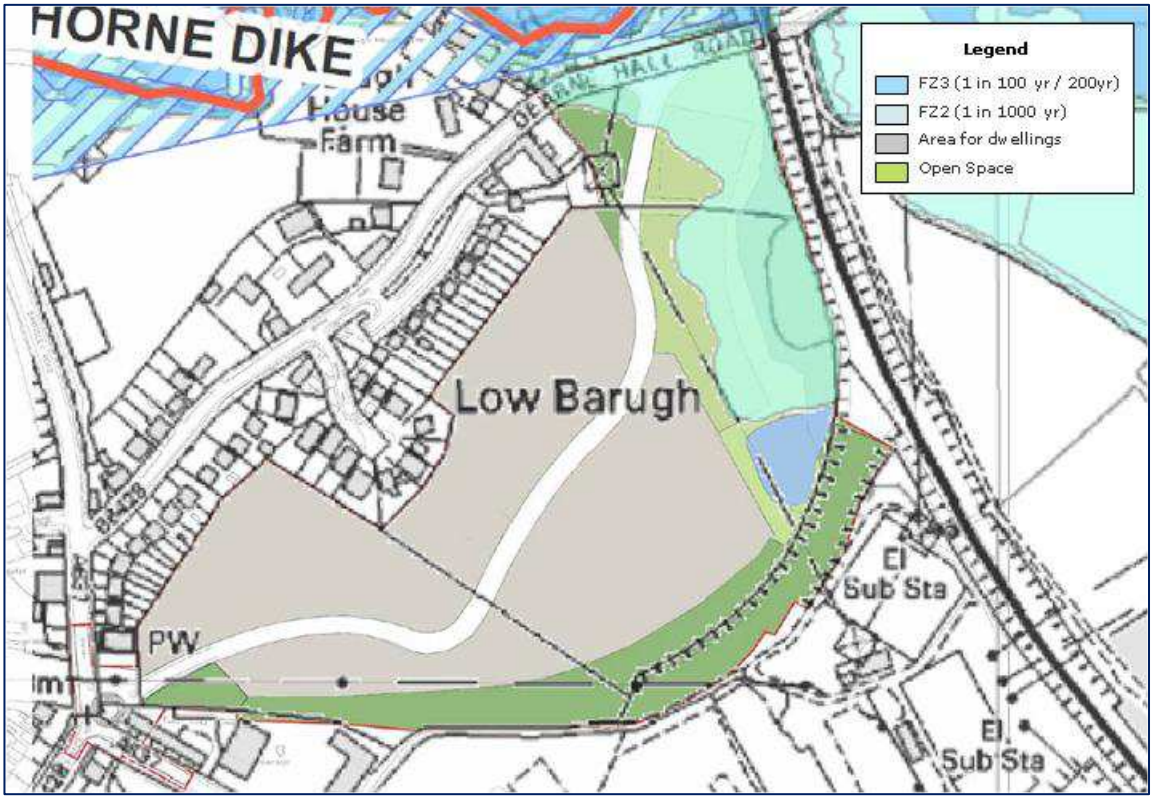


Figure 9: Draft Land Use Plan and Environment Agency Flood Zones

4.1.2 Finished Floor Levels

Although no development is proposed within Flood Zone 2, finished floor levels should be set at a minimum of 0.15m above adjacent ground levels following reprofiling of the site. This will enable any potential surface water to be conveyed safely across the site without affecting property in accordance with the approach promoted within DEFRA's Making Space for Water document.

4.2 ACCESS AND EGRESS

Access and egress to the site will continue to be provided via Barnsley Road following development. This route is shown to be located within Flood Zone 1 and will therefore provide dry access and egress to the site.

A new access point is also proposed to the north east of the site off Dearne Hall Road. According to the EA flood map, some inundation of this road may be expected during the 1 in 1000 year event; however if this occurs, alternate access/egress can be provided via Barnsley Road

5 SURFACE WATER

5.1 REQUIREMENTS FOR SURFACE WATER DRAINAGE

The NPPF requires developers and local authorities to seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems (SuDS).

As a minimum this is seen as a requirement that the peak flow rates of surface water leaving the developed site should be no greater than the rates prior to development. Opportunities to reduce surface water runoff, and the associated flood risk, should also be identified and climate change taken into consideration.

Recognising the above and the requirements of the EA[5], Building Regulations Approved Document H and the Code for Sustainable Homes Technical Guide (Category 4), surface water runoff from the proposed site should demonstrate:

- No increase in existing flow rates discharged to watercourse/public sewer
- The use of SuDS as the preferred method of dealing with surface water
- How runoff up to the 1 in 100 year event plus an allowance for climate change will be dealt with without increasing flood risk elsewhere

5.2 SITE AREAS

The existing and proposed impermeable and permeable areas at the site are shown in **Table 2**. This indicates that the extent of impermeable area at the site will increase by 3.713 ha following development. This based on an assumed impermeable area of 50% for the dwellings proposed in areas A and B.

Table 2: Site Areas

	Existing Site	Developed Site
Impermeable area (ha)	0.00	3.63
Permeable area (ha)	10.14	6.51
TOTAL	**10.14**	**10.14**

[5] Preliminary Rainfall Runoff Management for Developments, R&D Technical Report W5-074/A/TR/1 Revision C, 2005

5.3 SURFACE WATER RUNOFF FROM THE EXISTING SITE

The surface water regime at the existing site is determined by the site topography. The site falls from west to east towards the railway embankments along the eastern and southern boundaries. A natural surface water drainage system exists in the uncultivated wetland area in the south of the site (**Figure 10**). This area is drained by a ditch that runs along the disused railway embankment and discharges into the pond in the east. There is no known outfall for the pond. A drain forms the southeast border of the site and discharges underneath the railway to a disused canal to the east of the site.



Figure 10:Aerial Photograph of Site with Drainage Pathways

White Young Green (WYG) obtained public sewer records from Yorkshire Water (YW) which confirm there are no public surface water sewers within the site or in the immediate vicinity (**Appendix E**).

5.3.1 Existing Site Runoff Rate

The existing site is entirely permeable and the existing greenfield runoff rates are summarised in **Table 3**. These rates have been calculated using the ICP SUDS method within Micro Drainage. Details of the MicroDrainage input parameters and the output results are provided in **Appendix C.**

The greenfield runoff rate calculation requires a soil type to be input. According to the Soilscapes map the site could potentially be underlain by two very different soil types:

- naturally wet, loamy and clayey floodplain soils with high groundwater

- freely draining acid loamy soils

It does appear from **Figure 10** that the natural drainage at the site is impeded. The evidence for this is the presence of the pond, the wetland area and observed standing water. The naturally wet soils are associated with the river floodplain and, given the close proximity of Cawthorne Dike and the River Dearne, impeded drainage has been assumed at the site. Soil Type 3 (0.4) has been assumed in the greenfield runoff calculations. Soil Type 4 (0.45) would normally be appropriate where natural drainage is impeded and the use of Soil Type 3 in the calculations is a conservative approach.

Table 3: Total Peak Runoff Rate - Existing Site

Return Period	Total Existing Site Runoff Rate	
	l/s	l/s/ha
1 in 2 year	34.4	3.4
1 in 30 year	60.8	6.0
1 in 100 year	72.0	7.1

5.4 SURFACE WATER RUNOFF FROM THE DEVELOPED SITE

Table 2 indicates that impermeable areas at the site will increase following development. The following sections describe how surface water runoff from the developed site may be managed in accordance with the requirements of the NPPF and its supporting Technical Guidance.

5.4.1 Disposal of Surface Water

Building Regulations Approved Document Part H sets out a hierarchy of preferred methods for the disposal of surface water runoff[6]. These are listed below in order of preference:

1. Disposal by infiltration - As discussed previously, impeded drainage has been assumed. This means that it would not normally be possible to dispose of surface water by infiltration means.

   Infiltration should not, however, be discounted at this stage. A site investigation will need to be undertaken and, depending upon the findings, it may be appropriate to investigate the infiltration option at detailed design stage.

2. Disposal to a watercourse – The site slopes downwards towards the pond in the east, which accepts surface water from the existing undeveloped site. However, the outfall of the pond is not known.

   The drain, which forms the southeast border of the site discharges underneath the railway to a disused canal to the east of the site. It is proposed to discharge surface water into this drain at a controlled rate.

[6] Building Regulations Approved Document H Section 3 page 45

5.4.2 Surface Water Discharge Rate

The surface water drainage arrangements for any site should be such that the peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development.

It is proposed to limit runoff rates from the proposed impermeable areas to the existing 1 in 2 year greenfield runoff rate (i.e. **3.4 l/s/ha** – as calculated in **Appendix C**). Based upon the anticipated extent of impermeable area post development as provided in **Table 2** this equates to 12.3 l/s. This will ensure that runoff rates from the site do not increase following development, and that betterment is provided. The drainage system for the proposed site will be designed to manage flows in up to the 1 in 100 year event including an allowance for climate change. The existing permeable areas will continue to drain at greenfield runoff rates.

The total proposed peak runoff rates from the proposed site are shown in **Table 4**.

Table 4: Total Peak Runoff Rate – Developed Site

Return Period	Runoff Rate (l/s)		
	Impermeable areas	Permeable areas	Total
1 in 2 year	12.3	22.1	**34.4**
1 in 30 year	12.3	39.1	**51.4**
1 in 100 year	12.3	46.2	**58.5**

Comparison of the total peak runoff rates from the existing site (**Table 3**) with those from the developed site (**Table 4**) indicates that development will provide for significant betterment in terms of reduced surface water flows as encouraged by the NPPF and its supporting Technical Guidance.

5.4.3 SUDS Options and Storage Calculations

In order to restrict runoff rates from the proposed impermeable areas as set out in **Section 5.4.2** attenuation storage will be provided. SuDS elements may be used to provide the required storage.

SuDS aim to mimic natural drainage and can achieve multiple objectives such as removing pollutants from urban runoff at source, controlling surface water runoff from developments, and ensuring that flood risk is not increased downstream. Combining water management with green space can provide amenity and biodiversity enhancement. Typical SuDS components include surface or subsurface storage with flow limiting devices, roadside swales, detention basins and infiltration areas or soakaways.

The surface water storage facilities described in the following sections have been modelled using the Detailed Design module of MicroDrainage Source Control.

5.4.3.1 Storage Volume Calculation

The required storage volume has been sized to store the 1 in 100 year storm event including a 30% increase in rainfall intensity in order to allow for climate change in accordance with Table 5 of the NPPF Technical Guidance.

The parameters used in the storage calculation along with the MicroDrainage Source Control output results are provided in **Appendix D**. This indicates that a storage volume of **2,699m^3** would be required (based upon the anticipated extent of impermeable area post development as provided within **Table 2**.

This could be provided in the form of a dry detention basin and has been taken into account in the development proposals (**Appendix A**). The suitability of the proposed location of the storage pond has been discussed with BSG Ecology who are happy that the location is suitable, provided appropriate vegetation and SUDS treatment are incorporated.

Alternatively, some of this storage volume could be accommodated within the below ground surface water pipe system which will be adopted.

It should be noted that the required volume of storage would reduce should infiltration techniques subsequently be found to be feasible.

5.4.4 Maintenance of SUDS

In the past local planning authorities and water companies have been reluctant to adopt SuDS. With no arrangements in place that require local planning authorities or water companies to adopt SuDS their maintenance has subsequently been the responsibility of the developer.

The Flood and Water Management Act (2010) is currently being implemented through a series of Commencement Orders. Section 32 introduces Schedule 3: Sustainable Drainage. This introduces:

- New standards for the design, construction, operation and maintenance of new rainwater drainage systems
- A new 'approving body' (generally a unitary, county or county borough local authority)
- A requirement for the approving body to approve most types of rainwater drainage systems before any construction work with drainage implications can start, subject to: (i) the system being constructed in line with an approved drainage plan to national standards; (ii) the approving body being satisfied the drainage system has been built and functions in accordance with the drainage plan, and (iii) the system being a sustainable drainage system, as defined by regulations.

However, this provision is awaiting commencement following further work by DEFRA on arrangements for adoption and maintenance of SUDS, including technical guidance. It is envisaged that phased implementation of these arrangements will commence sometime in 2013.

In the meantime, other options for maintenance of SUDS include:

- SUDS elements within the curtilage of residential dwellings (e.g. soakaways, permeable paving) will be the responsibility of the owner of the property
- The pipe network, designed to Sewers for Adoption (6th edition) standard, will be adopted by the sewerage undertaker
- Roadside swales will be adopted by the highways authority
- SUDS in public open spaces (e.g. dry detention basin) may be adopted by the local authority

5.4.5 Final Drainage Layout

The purpose of this FRA is to demonstrate that a surface water drainage strategy is feasible for the site given the development proposals and the land available. The proposals provide the opportunity for the inclusion of SuDS elements, ensuring that there will be no increase in surface water runoff from the proposed development.

6 FOUL WATER

6.1.1 Existing Public Sewers

WYG undertook a Preliminary Infrastructure Assessment (PIA) (A076884 v2) for which public sewer records were obtained from YW (**Appendix E**).

The PIA states that the YW plans indicate the presence of a 225mm diameter public combined sewer crosses the south west corner of the site before heading north along Barnsley Road and then north east along Dearne Hall Road. Adjacent to the northern edge of the site it connects with a 525mm public combined sewer, flowing from the north west, at which point the diameter increases to 600mm. This 600mm sewer continues to flow along Dearne Hall Road in an easterly direction.

The PIA also states that a 150mm diameter public combined sewer is shown to flowing to the rear of nos. 84 to 114 Dearne Hall Road adjance to the north west site boundary. Downstream the 150mm sewer flows within the site along the boundary for a distance of approximately 60m before crossing into Dearne Hall Road and flowing east, where the diameter increases to 225mm and then 300mm.

YW typically would not permit any buildings within 3m, nor trees planted within 5m of either of the public sewers that flow within the site. Should the developer wish to have either of the public sewers diverted under Section 185 of the Water Industry Act, then an application should be made to YW.

6.1.2 Existing Private Sewers

The PIA states that it is unlikely that there are any active private foul sewers within the site due to the greenfield nature of it.

6.1.3 Proposed Public Sewers

WYG submitted a pre-development enquiry to YW Developer Services Team and YW has confirmed that domestic foul water from the development can discharge to the 300mm public combined sewer in Dearne Hall Road to the north of the site. The topography of the site slopes from the south west (71m AOD) to the north east (55m AOD) so WYG believe a gravity discharge from all proposed development areas to the 300mm sewer in Dearne Hall Road would appear feasible.

6.1.4 Proposed Private Sewers

Changes to the way in which new sewers are adopted have recently been implemented in line with the requirements of the Flood and Water Management Act 2010. Previously the adopting Authority (YW in this case) would take ownership of sewers outside the boundary of individual properties provided that relevant design standards were adhered to. Once adopted the water company would be responsible for the operation and maintenance of the new sewers. Sewers outside the boundaries of private properties will continue to be adopted as before, however, the sewers within private properties serving

2 or more dwellings will also now be adopted. The new version of 'Sewers for Adoption' (7th edition) outlines the standards of design required for sewers within private properties.

The proposed development will be affected by the changes, and it is therefore WYG recommends that all proposed sewers are designed to the standards outlined within Sewers for Adoption 7th Edition and that adoption of all new sewers is sought through YW. A formal application under Section 104 of the Water Industry Act 1991 would need to be made prior to construction. In addition, an application under Section 106 of the Water Industry Act 1991 would be required for the new connection to the 300mm public sewer in Dearne Hall Road.

7 SUMMARY

There are proposals for the development of approximately 150 dwellings with associated access roads and open amenity space at Dearne Hall Road, Low Barugh.

According to the EA flood map the proposed development area is located wholly within Flood Zone 1, with a small portion of proposed public open space to the north east of the site located in Flood Zone 2.

The River Dearne and Cawthorne Dike are situated approximately 100m to the north of the site. Based on the modelled flood levels obtained from the EA, some flooding of the north-eastern part of the site may be expected during all modelled levels; however this contradicts the EA flood map. Irrespective, no development is proposed in this area.

The historical flood data for these watercourses provided by the EA show the site experienced some surface water flooding in 2007, however the level of flood water is not known.

In order to mitigate against any residual risk of flooding from other sources such as pluvial, it is proposed to set finished floor levels at a minimum of 0.15m above adjacent ground levels following reprofiling of the site.

A culverted watercourse may be located within the area currently occupied by the industrial estate to the south of the site. Surcharging of upstream culvert manholes could potentially be a flood risk to the site; however any residual risk will be mitigated by setting finished floor levels at a minimum of 0.15m above adjacent ground levels following reprofiling of the site.

Dry access and egress to the site will be provided via Barnsley Road. This route is shown to be located within Flood Zone 1 and will therefore provide safe, dry access and egress to the site. A new access point is proposed to the north east of the site. According to the EA flood map, some inundation may be expected during the 1 in 1000 year event; however if this occurs, alternate access/egress can continue to be provided via Barnsley Road.

Following development, the overall impermeable areas at the site are expected to increase. A scheme for the provision and implementation of a surface water regulation system following the principles set out in this FRA should be submitted to and approved in writing by the local planning authority, prior to the commencement of development.

8 RECOMMENDATIONS

This FRA has demonstrated that the proposed development may be completed without conflicting with the requirements of the NPPF and it's supporting Technical Guidance subject to the following:

- Finished floor levels to be set at 0.15m above adjacent ground levels following reprofiling
- All development of dwellings to take place within Flood Zone 1
- The detailed drainage design, developed in accordance with the principles set down in this FRA, should be submitted to and approved by the local planning authority prior to the commencement of development.

APPENDIX A: Development Proposals



KEY

- Dedicated public open space
- Dedicated habitat areas
- Accessible habitat open space
- Residential Area
- Drainage pond
- Principal street/ access road

nlp Nathaniel Lichfield & Partners
Planning. Design. Economics.

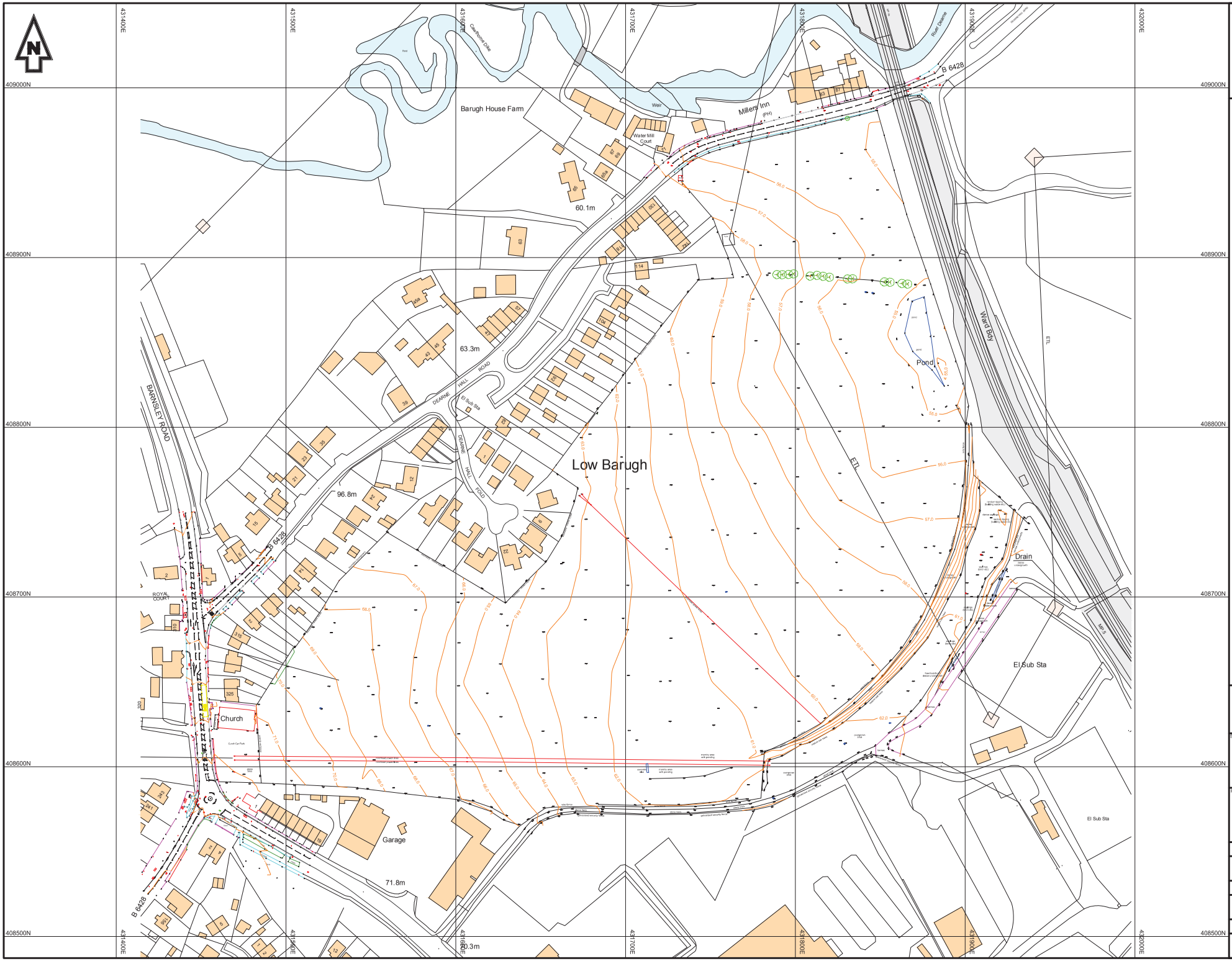
Project	Low Barugh, Barnsley
Title	**Land Uses Plan**
Client	Commercial Estates Properties Hallam Land Management
Date	March 2013
Scale	1:2000 @ A3
Drawn by	AH
Drg. No	IL21235-020

N

NE21235

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APPENDIX B: Topographic Survey



Notes

Co-ordinates and levels are based upon OSGB 1936 National Grid (OSGB36) and Ordnance Survey Datum Newlyn (ODN). They are derived using realtime on site GPS survey, that utilises the National Grid Transformation OSTN02 and the National Geoid Model OSGM02GB.

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Midland Surveying & Engineering
Tel: 01773 811867 Email: info@midsurvey.co.uk

Key

AV	Air Valve	KO	Kerb Outlet
BB	Belisha Beacon	LP	Lighting Column
BO	Bollard	MH	Manhole
BH	Borehole	Mkr	Marker
BT	Telephone Cover	PO	Post
CATV	Communications	RS	Road Sign
CAB	Control Cabinet	RE	Rodding Eye
ER	Earth Rod	SV	Stop Valve
EB	Electricity Box	TCB	Telephone Call Box
EL	Elecricity Cover	TP	Telegraph Pole
EP	Electricity Pole	TS	Traffic Signal
FH	Fire Hydrant	TH	Trial Hole
GAS	Gas Cover	VP	Vent Pipe
GU	Gulley	WO	Wash Out
IC	Inspection Cover	WM	Water Meter
		WV	Wheel valve

Hallam Land Management

Site

Low Barugh Barnsley

Plan

Existing Site

Scale	
1:1000 @ A1	
Date	
02-09-2011	
Project Ref.	Drawing No.
HLM/MSE/2625	3a

APPENDIX C: MicroDrainage Outputs for Greenfield Runoff

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	1.000	Urban	0.000
SAAR (mm)	700	Region Number	Region 3

Results	**l/s**
QBAR Rural	3.4
QBAR Urban	3.4
Q100 years	7.1
Q1 year	2.9
Q30 years	6.0
Q100 years	7.1

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APPENDIX D: MicroDrainage Storage Volume Calculation

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.298	0.298	12.0	801.3	O K
30 min Summer	0.398	0.398	12.1	1069.4	O K
60 min Summer	0.506	0.506	12.1	1358.0	O K
120 min Summer	0.617	0.617	12.1	1656.1	O K
180 min Summer	0.680	0.680	12.1	1824.7	O K
240 min Summer	0.721	0.721	12.1	1935.0	O K
360 min Summer	0.775	0.775	12.1	2079.9	O K
480 min Summer	0.811	0.811	12.1	2176.3	O K
600 min Summer	0.835	0.835	12.1	2242.0	O K
720 min Summer	0.852	0.852	12.1	2287.5	O K
960 min Summer	0.871	0.871	12.1	2339.2	O K
1440 min Summer	0.876	0.876	12.1	2353.0	O K
2160 min Summer	0.861	0.861	12.1	2311.0	O K
2880 min Summer	0.840	0.840	12.1	2254.5	O K
4320 min Summer	0.789	0.789	12.1	2119.8	O K
5760 min Summer	0.735	0.735	12.1	1972.8	O K
7200 min Summer	0.680	0.680	12.1	1825.2	O K
8640 min Summer	0.626	0.626	12.1	1680.3	O K
10080 min Summer	0.575	0.575	12.1	1542.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Summer	116.878	30
30 min Summer	78.200	45
60 min Summer	49.937	74
120 min Summer	30.810	134
180 min Summer	22.897	192
240 min Summer	18.424	252
360 min Summer	13.506	370
480 min Summer	10.835	488
600 min Summer	9.126	608
720 min Summer	7.927	726
960 min Summer	6.342	964
1440 min Summer	4.622	1430
2160 min Summer	3.362	1756
2880 min Summer	2.679	2132
4320 min Summer	1.942	2944
5760 min Summer	1.544	3752
7200 min Summer	1.291	4552
8640 min Summer	1.116	5368
10080 min Summer	0.987	6152

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Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Winter	0.335	0.335	12.1	898.5	O K
30 min Winter	0.447	0.447	12.1	1199.9	O K
60 min Winter	0.568	0.568	12.1	1524.4	O K
120 min Winter	0.693	0.693	12.1	1860.6	O K
180 min Winter	0.764	0.764	12.1	2051.8	O K
240 min Winter	0.811	0.811	12.1	2177.6	O K
360 min Winter	0.873	0.873	12.1	2344.7	O K
480 min Winter	0.915	0.915	12.1	2457.5	O K
600 min Winter	0.945	0.945	12.1	2536.1	O K
720 min Winter	0.965	0.965	12.1	2592.1	O K
960 min Winter	0.991	0.991	12.2	2660.6	O K
1440 min Winter	1.006	1.006	12.3	2699.8	O K
2160 min Winter	0.985	0.985	12.2	2645.8	O K
2880 min Winter	0.956	0.956	12.1	2567.7	O K
4320 min Winter	0.887	0.887	12.1	2382.5	O K
5760 min Winter	0.808	0.808	12.1	2170.6	O K
7200 min Winter	0.727	0.727	12.1	1951.1	O K
8640 min Winter	0.645	0.645	12.1	1730.6	O K
10080 min Winter	0.565	0.565	12.1	1515.8	O K

Storm Event	Rain (mm/hr)	Time-Peak (mins)
15 min Winter	116.878	30
30 min Winter	78.200	44
60 min Winter	49.937	74
120 min Winter	30.810	132
180 min Winter	22.897	190
240 min Winter	18.424	248
360 min Winter	13.506	364
480 min Winter	10.835	480
600 min Winter	9.126	596
720 min Winter	7.927	712
960 min Winter	6.342	942
1440 min Winter	4.622	1388
2160 min Winter	3.362	2000
2880 min Winter	2.679	2256
4320 min Winter	1.942	3196
5760 min Winter	1.544	4096
7200 min Winter	1.291	4976
8640 min Winter	1.116	5800
10080 min Winter	0.987	6568

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.360	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time / Area Diagram

Total Area (ha) 3.713

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.000	4-8	1.000	8-12	1.000	12-16	0.713

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APPENDIX E: Yorkshire Water Sewer Records

ATKINS CHECKED
MK

LNXX-8V7JMT Received:12 June 2012 Completed:13 June 2012

YORKSHIRE WATER
PROTECTION OF MAINS AND SERVICES - CLEAN WATER

1. Please note the positions of clean water apparatus shown on the enclosed plans are believed to be correct. However, Yorkshire Water (YW) will accept no responsibility in the event of any inaccuracy or omission. The actual position of such apparatus and that of service pipes which have not been indicated must be established on site by contacting the Customer Helpline (0845 124 24 24) for water and (0845 120 84 82) for sewerage.

2. To enable future repair works to be carried out without hindrance; any pipe, cable, duct, etc. installed parallel to a water main or service pipe should not be installed directly over or within 300mm of a water main or service pipe. Where a pipe, cable, duct, etc. crosses a main or service it should preferably cross perpendicular or at an angle of no less than 45o and with a minimum clearance of 150mm. These requirements apply to activities within an existing highway and are relevant to the installation of pipes, cables, ducts, etc. up to and including 250mm in diameter. Necessary protection measures for installations greater than 250mm in diameter and/or in private land will need to be agreed on an individual basis.
Installations within a new development site must comply with the National Joint Utilities Group publication Volume 2: NJUG Guidelines On The Positioning Of Underground Utilities Apparatus For New Development Sites.

3. All excavation works near to YW apparatus should be by hand digging only.

4. Backfilling with a suitable material to a minimum 300mm above YW apparatus is required.

5. If surface levels are to be decreased/increased significantly the effects on existing apparatus will be carefully considered and if any alterations are necessary, the costs of the alterations will be recharged to you in full. Outlets on fire hydrants must be no more than 300mm below the new levels and all surface boxes must be adjusted as part of the scheme.

6. Adequate support must be provided where any works pass under YW apparatus.

7. Jointing chambers, lighting columns and other structures must be installed in such a way that future repair or maintenance works to YW apparatus will not be hindered.

8. Apparatus such as; railings, sign posts, etc. must not be placed in such a way that they prevent access to or full operation of controlling valves, hydrants or similar apparatus. Care must also be taken not to bury or cover chamber lids for similar reasons.

9. Explosives shall not be used within 100 metres of any Yorkshire Water Services apparatus or installations.

10. Vibrating plant should not be used directly over any apparatus.

11. ***Under no circumstances*** should thrust boring or similar trenchless techniques commence until the actual position of the Company's mains/services along the proposed route have been confirmed by trial holes.

12. Any alterations to the highway should be notified following the procedures outlined in the New Road and Street Works Act 1991 Code of Practice; Measures Necessary Where Apparatus Is Affected By Major Works (Diversionary Works).

13. Should YW incur any costs as a result of non-compliance with the above, all costs will be rechargeable in full.

14. In accordance with the New Roads and Street Works Act 1991, Chapter 22, Part 3, Section 80. The location of any identified YW asset "*which is not marked, or is wrongly marked, on the records made available*" should be communicated back to Yorkshire Water. The location of the apparatus should be identified on copies of the supplied plans which should be returned to Yorkshie Water with photographic supporting evidence where possible.

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YORKSHIRE WATER
PROTECTION OF MAINS AND SERVICES - WASTE WATER

1. The position of Yorkshire Water Services Ltd (YWS) apparatus shown on the existing mains record drawing(s) indicates the ***general*** position and nature of our apparatus and the accuracy of this information cannot be guaranteed. Any damage to YWS apparatus as a result of your works may have serious consequences and you will be held responsible for all costs incurred. Prior to commencing major works, the exact location of apparatus must be determined on site, if necessary by excavating trial holes. The actual position of such apparatus and that of service pipes which have not been indicated must be established on site by contacting the Customer Helpline (0845 124 24 24) for water and (0845 124 24 29) for sewerage.
2. The public sewer network is lawfully retained in its existing position and the sewerage undertaker is entitled to have it remain so without any disturbance. The provisions of section 159 of the Water Industry Act 1991 provides that the sewerage undertaker may "inspect, maintain, adjust, repair or alter" the network. Those rights are given to enable the sewerage undertaker to perform its statutory duties. Any development of the land or any other action that unacceptably hindered the exercise of those rights would be unlawful.
3. Ground levels over existing YWS apparatus are to be maintained. Sewers in highways will ***generally*** be laid to give 1200mm of cover from finished ground level working to kerb races, other permanent identification of the limits of the road or to an agreed line and level. Substantial increases or decreases to this 1200mm depth of cover will result in the sewer being re-laid at your expense.
4. If surface levels are to be decreased / increased significantly the effects on existing water supply apparatus will be carefully considered and if any alterations are necessary, the costs of the alterations will be recharged to you in full. Outlets on fire hydrants must be no more than 300mm below the new levels and all surface boxes must be adjusted as part of the scheme.
5. To enable future repair works to be carried out without hindrance; any pipe, cable, duct, etc. installed parallel to a water main or service pipe should not be installed directly over or within 300mm of a water main or service pipe or 1000mm of a waste water asset. Where a pipe, cable, duct, etc. crosses a main or service it should preferably cross perpendicular or at an angle of no less than 45° and with a minimum clearance of 150mm. These requirements apply to activities within an existing highway and are relevant to the installation of pipes, cables, ducts, etc. up to and including 250mm in diameter. Necessary protection measures for installations greater than 250mm in diameter and/or in private land will need to be agreed on an individual basis. Installations within a new development site must comply with the National Joint Utilities Group publication Volume 2: NJUG Guidelines On The Positioning Of Underground Utilities Apparatus For New Development Sites.
6. All excavation works near to YW apparatus should be by hand digging only.
7. Backfilling with a suitable material to a minimum 300mm above YW apparatus is required.
8. Adequate support must be provided where any works pass under YW apparatus.
9. Jointing chambers, lighting columns and other structures must be installed in such a way that future repair or maintenance works to YW apparatus will not be hindered.
10. Apparatus such as; railings, sign posts, etc. must not be placed in such a way that they prevent access to or full operation of controlling valves, hydrants or similar apparatus. YWS surface boxes must not be covered or buried. Any adjustment, alteration or replacement of manhole covers must be agreed on site prior to the commencement of the works with a YWS Inspector who may be contacted via our Call Centre on 0845 124 24 29.
11. Explosives shall not be used within 100 metres of any Yorkshire Water Services apparatus or installations.
12. Vibrating plant should not be used directly over any apparatus. Movement or operation by vehicles or heavy plant is not to be permitted in the immediate vicinity of YWS plant or apparatus unless there has been prior consultation and, if necessary, adequate protection provided without cost to YWS.
13. ***Under no circumstances*** should thrust boring or similar trenchless techniques commence until the actual position of the Company's mains/services along the proposed route have been confirmed by trial holes.
14. Any alterations to the highway should be notified following the procedures outlined in the New Road and Street Works Act 1991 Code of Practice; Measures Necessary Where Apparatus Is Affected By Major Works (Diversionary Works).
15. You will be held responsible for any damage or loss to YWS apparatus during and after completion of work, caused by yourselves, your servant or agent. Any damage caused or observed to YWS plant or apparatus should be immediately reported to YWS. Should YW incur any costs as a result of non-compliance with the above, all costs will be rechargeable in full.
16. You should ensure that nothing is done on the site to prejudice the safety or operation of YWS employees, plant or apparatus.
17. In accordance with the New Roads and Street Works Act 1991, Chapter 22, Part 3, Section 80. The location

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of any identified YW asset "*which is not marked, or is wrongly marked, on the records made available*" should be communicated back to Yorkshire Water. The location of the apparatus should be identified on copies of the supplied plans which should be returned to Yorkshie Water (Asset Records Team) with photographic supporting evidence where possible.

18. The Government has decided that responsibility for private sewers serving two or more properties and lateral drains (the section of pipe beyond the boundary of a single property, connecting it to the public sewer) will be transferred to the water companies on the 1st October 2011. Private pumping stations will also transfer during the period 1st October 2011 – 1st Oct 2016. Records of these assets may not yet be shown on the existing mains record drawing(s). If you encounter any of these assets you must inform Yorkshire Water Services Ltd (YWS).
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Sewer Legend


Combined Sewer


S24 Combined Sewer


Surface Water Sewer


S24 Surface Water Sewer


Foul Sewer


S24 Foul Sewer


Section 104 Sewer

Public Rising Main


Pumping Station


Abandoned Sewer



Public Sewage
Treatment Works


Syphon Sewer &
Vacuum Sewer

\+ Property Identifier

Water Legend

Water Main 4" and below

Water Main 4" and above

Raw Water Main

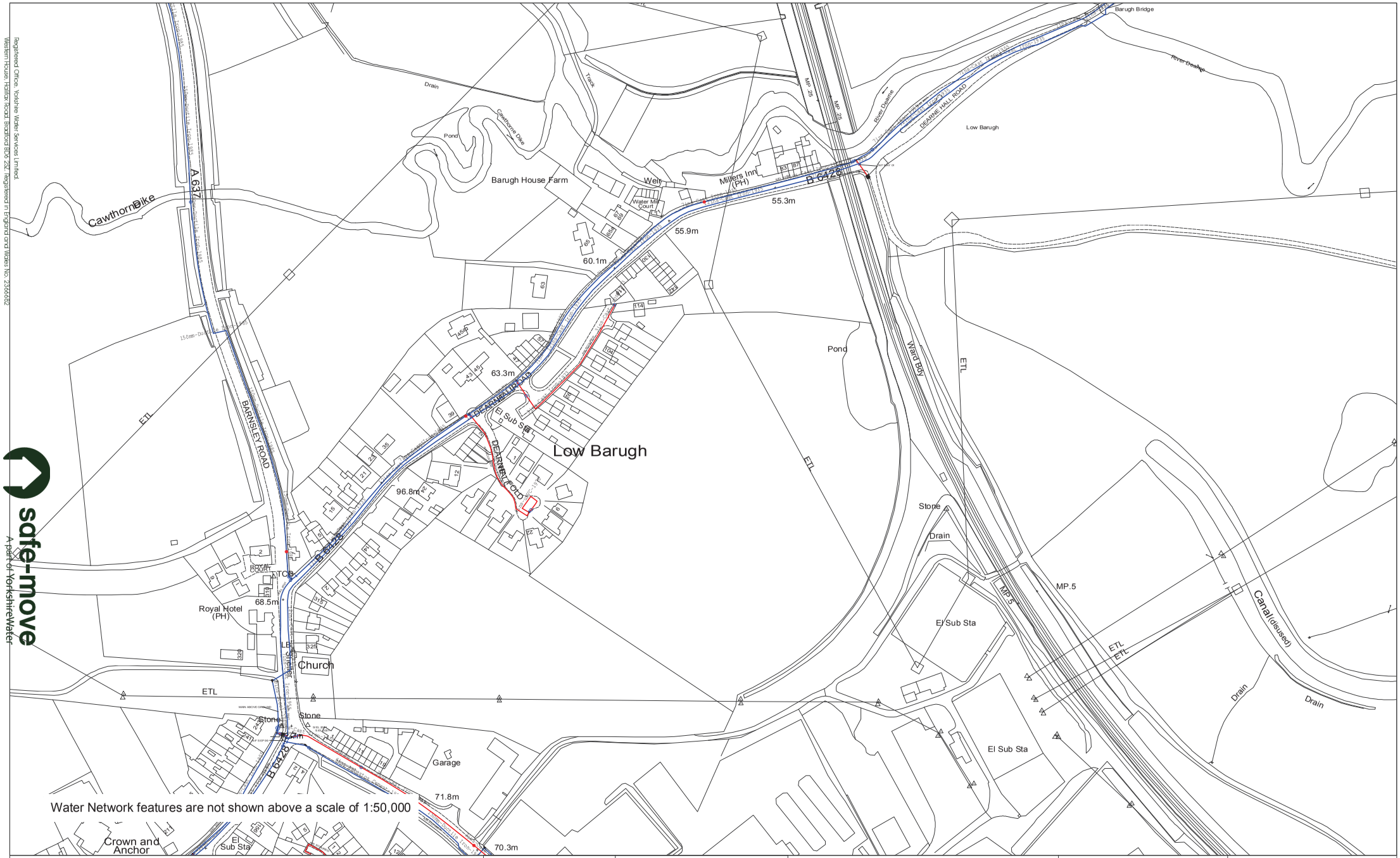
Private Water Main


Fire Hydrant


Pumping Station

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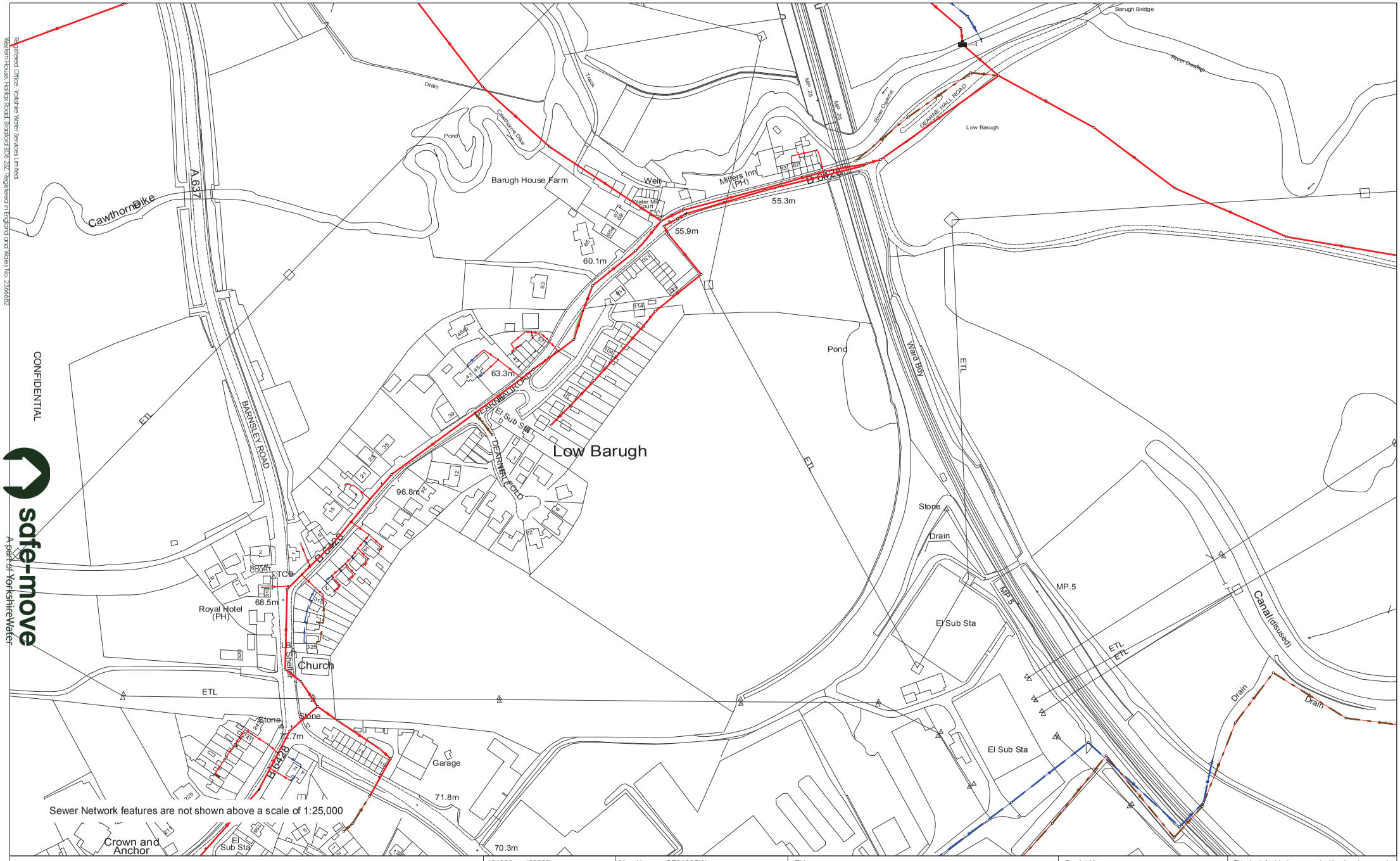


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431306 : 408527	Map Name : SE3108SW	Title	Partial Key Water mains up to 4" in diameter Water mains over 4" in diameter Raw water mains Private water mains
YorkshireWater	Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : Ms H Webster Contact Tel :	Notes	The position and depths of apparatus shown on this plan are approximate only. The exact positions and depths should be obtained by excavation trial holes.
		(Ody) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMSO © Crown copyright and database 2004. All rights reserved Ordnance Survey Licence number 100019559	Scale : 1:2500 Drg No : Maris No : Date Req : 13/06/2012, 08:36:11 Date Gen : 13/06/2012, 08:36:12 Source : Water Network Enquiry

UPN: Undefined Originator: H Webster, Safe Move,



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	431306 : 408527	Map Name : SE3108SW	Title
	YorkshireWater	Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : Ms H Webster Contact Tel :	Notes

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Partial Key

Foul Sewer = F
Combined Sewer = C
Surface Water Sewer = SW
Trade Sewer = TD
Partially Separate = PS

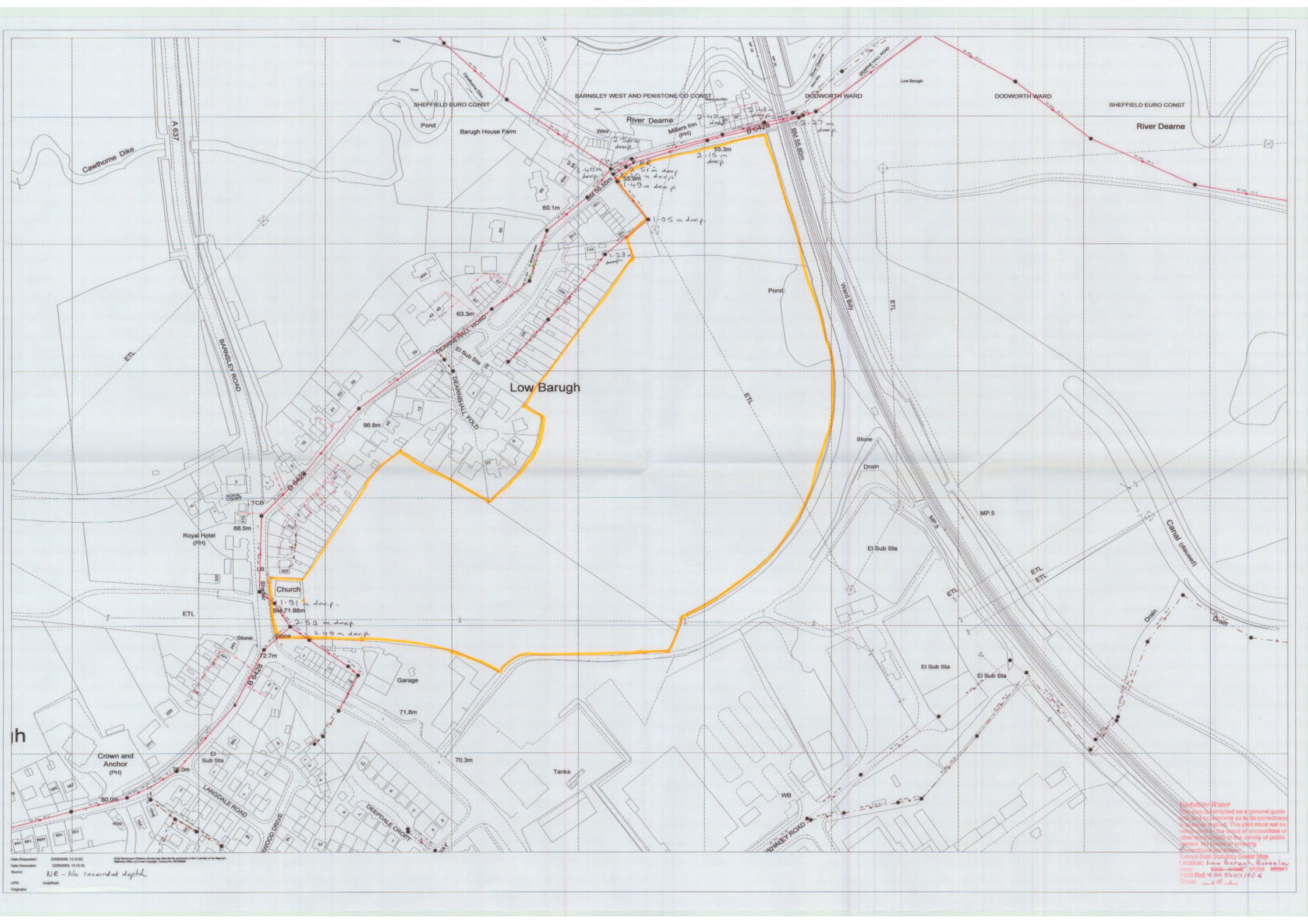
This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connection

Date Req : 13/06/2012, 08:36:24

Date Gen : 13/06/2012, 08:36:25

Source : Sewer Network Enquiry

UPN: Undefined Originator: H Webster, Safe Move,


Low Barugh
Cawthorne Dike
A 637
BARNSLEY ROAD
B 6428
DEARNEHALL ROAD
DEARNEHALL FOLD
River Dearne
Barugh House Farm
Millers Inn (PH)
Weir
Pond
SHEFFIELD EURO CONST
BARNSLEY WEST AND PENISTONE CO CONST
DODWORTH WARD
Low Barugh
Ward Bdy
ETL
MP.5
Canal (disused)
Drain
Stone
El Sub Sta
Garage
Tanks
WB
Church
TCB
Royal Hotel (PH)
Crown and Anchor (PH)
LANGDALE ROAD
DEEPDALE CROFT
WHALEY ROAD
BM 55.80m
BM 66.55m
BM 71.88m
55.3m
55.9m
60.1m
63.3m
96.8m
68.5m
72.7m
71.8m
70.3m
75.0m
80.0m
1.05 m deep
1.23 m deep
1.91 m deep
2.51 m deep
2.52 m deep
2.40 m deep
2.56 m deep
2.15 m deep
1.49 m deep
2.27 m deep
NE - No recorded depth