



Flood Risk Assessment

*Submitted as part of the Outline Planning Application for
Land to the east of Clitheroe Road (Lawsonsteads Farm), Whalley*

COMMERCIAL ESTATES GROUP



LAND EAST OF CLITHEROE ROAD, WHALLEY

FLOOD RISK ASSESSMENT Final Report v1.1

March 2012

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Flood Risk Assessment
Final Report v1.1

Client: Commercial Estates Group

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1 INTRODUCTION

Weetwood has been instructed by Commercial Estates Group to undertake a Flood Risk Assessment (FRA) in association with the proposed development of a site located to the east of Clitheroe Road, Whalley, in accordance with the requirements of National Planning Policy Framework (NPPF).

A FRA was prepared in February 2011 in support of a planning application (application reference: 3/2011/0111) for the wider site also encompassing the land to the east and south. The application was refused in January 2012 on matters not related to flood risk or drainage. The FRA was previously submitted to and accepted¹ by the Environment Agency (EA).

1.1 SITE LOCATION

The site is located at Ordnance Survey National Grid Reference SD 735 366, as shown in **Figure 1**. The site is approximately 3.79 hectares (ha) in area.

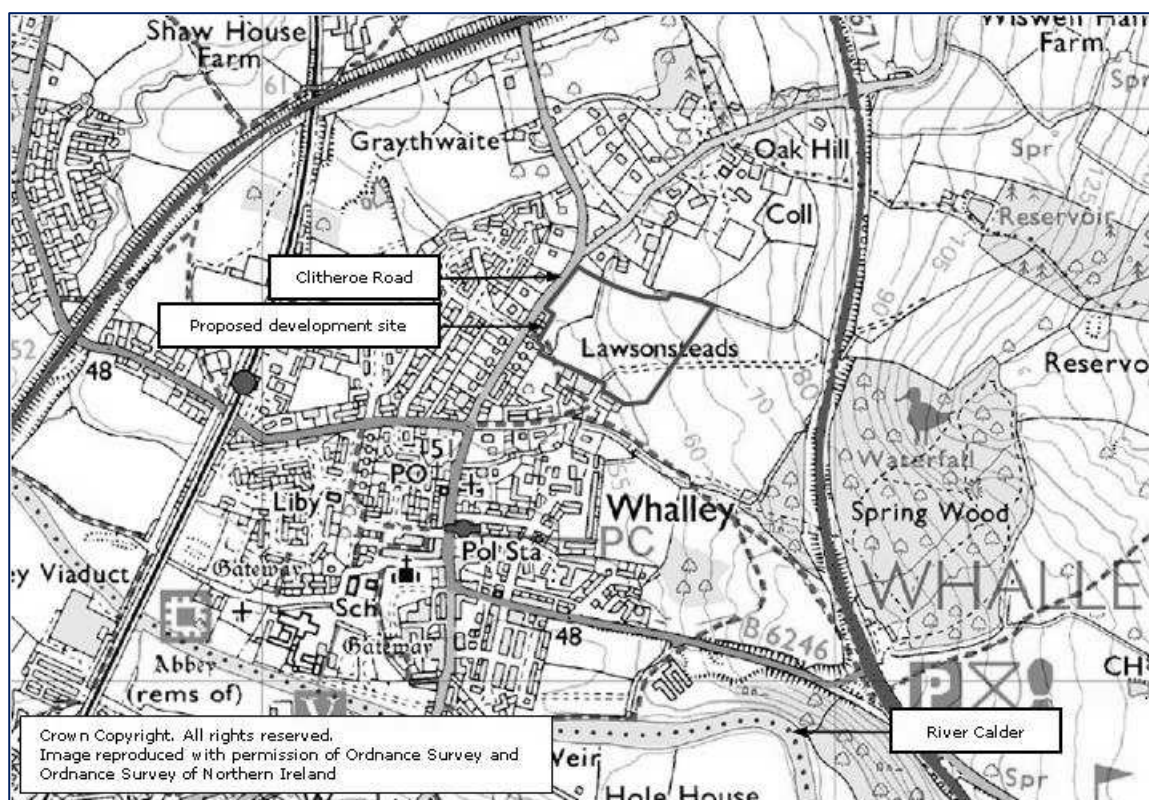


Figure 1: Site Location

1.2 EXISTING AND PROPOSED DEVELOPMENT

The site currently comprises greenfield land.

¹ EA letter dated 2 March 2011 (EA Ref: CE/2011/104454/01-L01)

Proposals are for the development of residential dwellings, a nursing home and associated car parking and landscaping (**Appendix A**).

The proposals are for residential / residential care home use, which is classified as '*more vulnerable development*' in Table 2 of the Technical Guidance to the NPPF.

1.3 SITE LEVELS

A topographic survey of the site has been undertaken by Met Surveys Ltd and is provided in **Appendix B**.

Levels to the east of the watercourse that flows through the site are shown to slope in a south-westerly direction from 59.00 to 55.50 metres Above Ordnance Datum (m AOD). Levels to the west of the watercourse fall from 68.00m AOD in the north-east to 58.00m AOD in the south/south-west.

1.4 ACCESS AND EGRESS

Access and egress to the site is provided via Clitheroe Road to the west. Levels along this route are in the region of 55.20-59.00m AOD adjacent to the site.

2 NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

The aim of NPPF 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 Technical Guidance to 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 EA Flood Map (**Figure 2**) the site is located in Flood Zone 1.

(Source: Environment Agency website)

A Level 1 Strategic Flood Risk Assessment (SFRA) was undertaken by Ribble Valley Borough Council (BC) in May 2010. The SFRA has been reviewed and the information therein has been used to inform this FRA.

The aim of the Sequential Test (as outlined in Section 10 Paragraph 101 of NPPF and Paragraphs 3-5 of the Technical Guidance to NPPF) is to encourage development to be located in areas at the lowest probability of flooding.

The proposed development site is situated within Flood Zone 1 and therefore satisfies the requirements of the Sequential Test.

Table 1 of the Technical Guidance to NPPF states that for development proposals on sites in Flood Zone 1 comprising one hectare or above, the vulnerability to flooding from other sources and the effect of the new development on surface water run-off should be incorporated in a FRA.

Other potential sources of flooding are discussed in **Section 3** of this report. The effect of the new development on surface water run-off is addressed in **Section 4**.

3 FLOOD RISK

3.1 HISTORICAL RECORDS OF FLOODING

Approximately 0.25km to the south of the site, Watercourse C (**Figure 3**) is culverted under King Street. Lancashire County Council (CC) has advised² that in the past debris has built up at the trash screen causing the King Street culvert to surcharge, resulting in floodwaters flowing in a southerly direction down King Street. The trash screens are inspected weekly by Lancashire CC, or more frequently if heavy rain is forecast. This does not pose a flood risk to the site.

3.2 FLUVIAL

An existing watercourse is located through the centre of the site with a number of other watercourses also located within the surrounding area as illustrated in **Figure 3**.

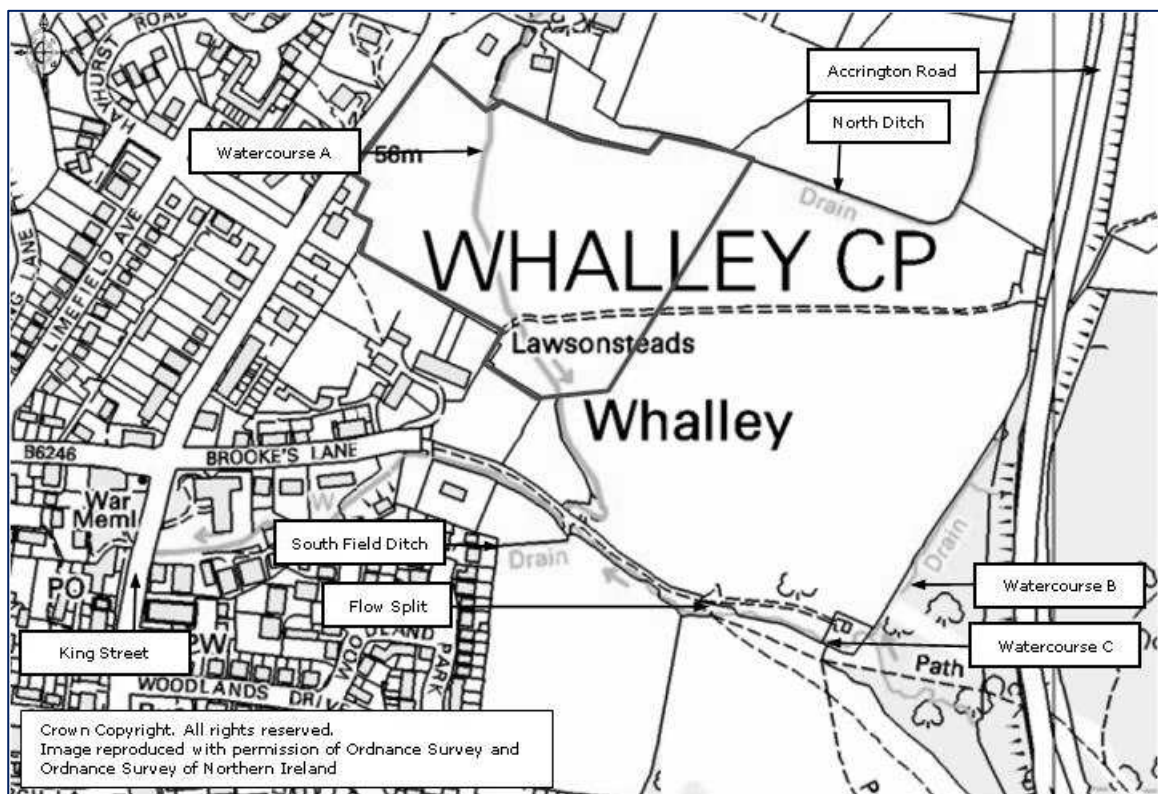


Figure 3: Watercourses

3.2.1 Watercourse A

Watercourse A flows in a south-easterly direction through the site. Ground levels on the right (west) bank generally slope away from the watercourse towards the west. An existing embankment runs along the right bank of Watercourse A. The embankment gives way to a flood defence in the form of a

² Telecom C Cornmell (Weetwood) and M Barnes (Lancashire County Council) on 12 October 2010

wooden board slotted between concrete blocks at the location of a ford crossing.

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

3.2.2 Watercourse B

According to the OS map Watercourse B flows under Accrington Road before flowing in a southerly direction to the east of the site.

During a site visit on 17 September 2010, it was observed that the channel bed was several metres below the adjoining land to the west for most of its reach. However the right bank diminished along one section, such that the bed levels were only a short distance below this. In times of high flow, there is a risk of overtopping of the right bank. However, given the distance between the site and the watercourse, and recognising the site topography, the risk of flooding from this source is considered low.

3.2.3 Watercourse C

According to the OS map Watercourse C flows under Accrington Road before receiving inflows from Watercourse B and proceeding in a westerly direction. A flow split structure (see **Figure 3**) diverts most of the flow southwards, where it ultimately discharges to the River Calder according to Lancashire CC³. The remaining flow proceeds in open channel in a westerly direction. The open channel is then culverted beneath an access track immediately downstream of which Watercourse A converges with Watercourse C.

Recognising the topography of the site and surrounding area the risk of flooding from this source is therefore considered low.

3.2.4 Ditches

Two ditches are located within the vicinity of the site; North Ditch to the north-east and South Field Ditch to the south. Both of these ditches were dry during a site visit on 17 September 2010. Due to existing ground levels South Field Ditch would not pose a risk of flooding to the site. The risk of flooding from North Ditch is also considered to be low, however, any residual risk of flooding will be mitigated through the implementation of the measures proposed in **Section 4** of this report.

3.3 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.

³ Telecom C Cornmell (Weetwood) and M Barnes (Lancashire County Council) on 12 October 2010

According to the Soilscales maps produced by the National Soils Research Institute⁴ soil conditions at the site and within the surrounding area are described as '*slowly permeable seasonally wet acid loamy and clayey soils*'. The permeability of the underlying soil conditions and the subsequent propensity for groundwater flooding may therefore be considered low.

Paragraph 4.25 of the SFRA states that '*following consultation with the EA, no evidence of groundwater flooding in the area has been identified*'.

According to the British Geological Survey (BGS) Groundwater Flooding Hazard map (**Figure 4**) the susceptibility to groundwater flooding is moderate to significant.

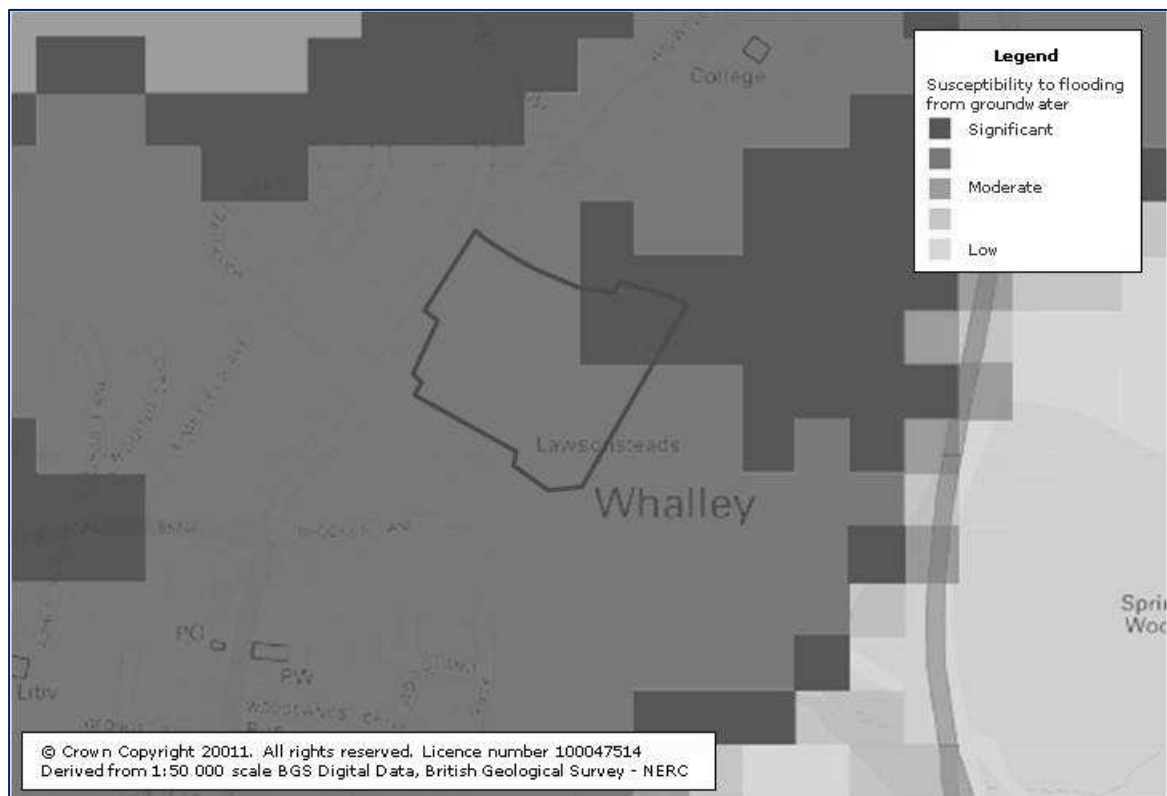


Figure 4: BGS Groundwater Flooding Hazard Map

(Source: Findmaps)

Recognising the information contained within the SFRA and the Soilscales maps the propensity for groundwater flooding may be considered low. However, any residual risk of flooding from this source will be mitigated through the implementation of the measures proposed in **Section 4** of this report.

3.4 SURFACE WATER

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

⁴ Soilscales www.landis.org.uk/soilscales/

3.4.1 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 Soilscales maps the underlying ground conditions are described as '*slowly permeable seasonally wet acid loamy and clayey soils*'. There may therefore be the propensity for surface water flooding at the existing site. However, site levels on the western section of the site are shown to fall in a south/south-easterly direction to Watercourse A and Watercourse B, whilst site levels on the eastern section of the site fall to the south-west towards Watercourse A. As such surface water would not be expected to accumulate to any significant depth at the site itself.

The propensity for pluvial flooding at the site is therefore considered to be low. 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**.

3.4.2 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.

United Utilities (UU) has advised⁵ that they do not hold any records of public sewer flooding of properties in this vicinity as a result of overloaded sewers.

3.4.3 Highway Drains and Gullies

Lancashire CC Highways Department has been consulted to ascertain whether it holds any records of highways flooding at or within the vicinity of the site.

Lancashire CC advised of the flooding associated with the King Street culvert as detailed in **Section 3.1**. Additionally, flooding of King Street is understood to have occurred in the winter of 2009/2010 as a result of the lack of maintenance of a 450 diameter concrete pipe with a hydrobrake located in Hayhurst Road and Clitheroe Road, designed for storage. Lancashire CC advised that UU now have a maintenance schedule in place. This is not expected to pose a flood risk to the site. Lancashire CC confirmed that there are no flooding problems associated with the highways drains and gullies in the vicinity of the site.

⁵ Email from United Utilities to Weetwood dated 7 September 2010

4 MITIGATION MEASURES

4.1 FLOOD MITIGATION

Any residual risk of flooding from Watercourse A, groundwater and surface water will be mitigated through the implementation of the measures proposed within the following section of this report.

4.1.1 Finished Floor Levels

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.

4.1.2 Watercourse A Embankment

Development of the site should ensure that the integrity of the existing embankment located along the right bank of Watercourse A remains (e.g. no lowering for new access crossings) and is bolstered where necessary. The embankment should be maintained within a public open space area.

4.2 ACCESS AND EGRESS

Access and egress to the site will continue to be provided via Clitheroe 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 road will be required across Watercourse A (**Appendix A**). The culvert will be designed to accommodate the 1 in 100 year flow including an appropriate allowance for climate change and suitable freeboard. The details will be agreed with the EA at the design stage.

4.3 ORDINARY WATERCOURSE

Watercourse A is classified as a Ordinary watercourse. A minimum 5m undeveloped buffer strip has been provided adjacent to Watercourse A for maintenance purposes and to offer ecological benefit, with no buildings located within over 10m.

5 SURFACE WATER

5.1 REQUIREMENTS FOR SURFACE WATER DRAINAGE

The Technical Guidance to NPPF recommends that developers should seek opportunities to reduce the overall level of flood risk in the area and beyond through the appropriate application of sustainable drainage systems (SUDS) to mimic natural drainage as closely as possible.

Consequently, redevelopment of the site should ensure that the peak flow rates of surface water leaving the developed site are 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 EA⁶, Building Regulations Approved Document H, the Code for Sustainable Homes Technical Guide (Category 4), and the requirement placed upon local planning authorities in NPPF to give priority to the use of SUDS, 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 site has been divided into two for the purposes of assessing surface water runoff; the area to the west of Watercourse A and the area to the east.

The existing and proposed impermeable and permeable areas within each area of the site are shown in **Table 1**. This indicates that the overall extent of impermeable area at the site will increase by 1.63 ha following development.

Table 1: Site Areas

	Existing Site		Developed Site	
	West	East	West	East
Impermeable area (ha)	0.00	0.00	0.68	0.95
Permeable area (ha)	1.40	2.39	0.72	1.44
TOTAL	1.40	2.39	1.40	2.39

5.3 SURFACE WATER RUNOFF FROM THE EXISTING SITE

The site is currently an area of undeveloped greenfield land. No existing drainage system is therefore present.

⁶ Preliminary Rainfall Runoff Management for Developments, R&D Technical Report W5-074/A/TR/1 Revision C, 2005

As detailed previously site levels on the west area of the site fall in a south/south-westerly direction whilst site levels on the east area fall to the south-west towards Watercourse A. It is therefore reasonable to assume that surface water from the east area currently runs off to Watercourse A.

5.3.1 Existing Site Runoff Rate

The peak runoff rates for the existing site are summarised in **Table 2**.

- Greenfield runoff rates from permeable surfaces have been calculated using the ICP SUDS method within MicroDrainage. Details of the MicroDrainage input parameters and the output results are provided in **Appendix C**.

Table 2: Total Peak Runoff Rate - Existing Site

Return Period	Runoff Rate (l/s)					
	Impermeable areas		Permeable areas		Total	
	West	East	West	East	West	East
1 in 2 year	0.0	0.0	9.4	16.0	9.4	16.0
1 in 30 year	0.0	0.0	16.0	27.2	16.0	27.2
1 in 100 year	0.0	0.0	19.6	33.5	19.6	33.5

5.4 SURFACE WATER RUNOFF FROM THE DEVELOPED SITE

Table 1 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 NNPF.

5.4.1 Surface Water Discharge Rate

It is proposed to limit runoff rates from the proposed impermeable areas to the 1 in 2 year greenfield flow rate as calculated in **Appendix C**. This equates to **4.6l/s** for the west area and **6.3l/s** for the east area. 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 3**.

Table 3: Total Peak Runoff Rate – Developed Site

Return Period	Runoff Rate (l/s)					
	Impermeable areas		Permeable areas		Total	
	West	East	West	East	West	East
1 in 2 year	4.6	6.3	4.8	9.7	9.4	16.0
1 in 30 year	4.6	6.3	8.2	16.5	12.8	22.8
1 in 100 year	4.6	6.3	10.1	20.2	14.7	26.5

Comparison of the total peak runoff rates from the existing site (**Table 2**) with those from the developed site (**Table 3**) indicates that development will provide for significant betterment in terms of reduced surface water flows as encouraged by NPPF.

5.4.2 Disposal of Surface Water

Building Regulations Approved Document Part H sets out a hierarchy of preferred methods for the disposal of surface water runoff⁷. These are listed below in order of preference:

1. Disposal by infiltration - According to the Soilscales and HR Wallingford Procedure maps, the underlying soil conditions have a low to negligible permeability. It is therefore unlikely that infiltration will be a feasible method for disposal of surface water runoff from the redeveloped site.
2. Disposal to a watercourse - As detailed previously, due to the site topography it is assumed that surface water currently runs off to Watercourse A. It is proposed to discharge surface water from the proposed impermeable areas to Watercourse A.
3. Disposal to a public sewer - Following redevelopment of the site it should not be necessary to discharge surface water runoff into the public sewer system.

5.4.3 SUDS Options and Storage Calculations

In order to restrict runoff rates from the proposed impermeable areas as set out in **Section 5.4.1**, 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 Technical Guidance to the NPPF.

The parameters used in the storage calculations along with the MicroDrainage Source Control output results are provided in **Appendix D**. These indicate that a storage volume of **471.1m³** would be required for the west area and **657.2m³** for the east area.

⁷ Building Regulations Approved Document H Section 3 page 45

Due to the site topography it is proposed to drain the two parcels of land to separate dry detention basins located within the southern section of each area.

The west area generally slopes to the south/south-west. It may be difficult to drain the more lower-lying parts of the west area to the proposed storage facility and for the facility to subsequently discharge by gravity to Watercourse A within the site boundary. Some site raising may therefore be required within the vicinity of the proposed nursing home. Alternatively an outfall to Watercourse A may be provided further downstream beyond the red line boundary.

5.4.4 Maintenance of SUDS

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. At present it is envisaged that implementation of these arrangements will be Autumn 2012.

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
- A management company

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.

This FRA has demonstrated that, not only can the required storage be accommodated within the site layout, but that ample land is available, providing flexibility for the final drainage solution. A final decision on the types of storage to be provided will be made at the detailed drainage design stage.

Appendix E provides an indicative drainage layout for the site. It must be noted that this is indicative only and that a final decision on the type of storage to be provided will be made at the detailed drainage design stage.

6 FOUL DRAINAGE

Weetwood previously developed a foul drainage strategy in support of the planning application for the wider site encompassing the land to the east and south. This was based upon the following proposals:

- 300 residential dwellings
- Nursing home
- Single form entry primary school

The strategy included proposals to connect foul flows from the area to the west of Watercourse A to the existing 225mm diameter public sewer running through this area of the site (at manhole 5601 or a new manhole just downstream - **Appendix F**). The area to the east of Watercourse A was proposed to discharge to the public sewer located in Brookes Lane.

Within UUs response to the original planning application dated 20 December 2011⁸ (**Appendix G**) no objection was raised to the above proposals on capacity grounds. However, UU requested the following condition be imposed as part of any planning permission granted:

Unless otherwise agreed in writing by the local planning authority no part of the development other than:

- a) 222 dwelling units; or*
- b) 161 dwelling units and the proposed nursing home*

shall be occupied before the date which is 54 months from the date of the planning permission.

This was recommended in order to allow the sewerage undertaker sufficient time to address capacity at the Whalley Wastewater Treatment Works and the capacity of the sewer network serving the development.

The current proposals (**Appendix A**) are significantly less than the acceptable numbers indicated by UU in their letter dated 20 December 2011 (and as detailed above). As such the public sewer network is expected to have sufficient capacity to accept foul flows from the development.

As previously proposed the development may connect the public sewer as follows:

- West Area - To the existing 225mm diameter public sewer running through this area of the site (at manhole 5601 or a new manhole just downstream)
- East Area - To the public sewer located in Brookes Lane.

⁸ UU Ref: DC/11/5196

7 SUMMARY

There are proposals for development of a site located to the east of Clitheroe Road, Whalley.

According to the EA flood map the proposed development site is located outside the 1 in 1000 year flood outline and is therefore defined as being situated within Flood Zone 1 under NPPF.

The proposed development site, being located in Flood Zone 1, satisfies the requirements of the Sequential Test.

The risk of flooding from fluvial sources, groundwater and surface water is considered to be low.

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

Development of the site should ensure that the integrity of the existing embankment located along the right bank of Watercourse A remains (e.g. no lowering for new access crossings) and is bolstered where necessary. The embankment should be maintained within a public open space area.

Clitheroe Road is shown to be located within Flood Zone 1 and will therefore provide dry access and egress to the site. A new access road will be required across Watercourse A. The culvert will be designed to accommodate the 1 in 100 year flow including an appropriate allowance for climate change and suitable freeboard. The details will be agreed with the EA at the design stage.

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 NPPF subject to the following:

- Finished floor levels to be set at 0.15m above adjacent ground levels following reprofiling
- The integrity of the embankment along the right bank of Watercourse A through the site to be maintained and bolstered where necessary, within a public open space area
- Details of the culvert for the new access crossing to be agreed with the EA at the detailed design stage
- 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:

Indicative Masterplan



APPENDIX B:

Topographic Survey



Met®

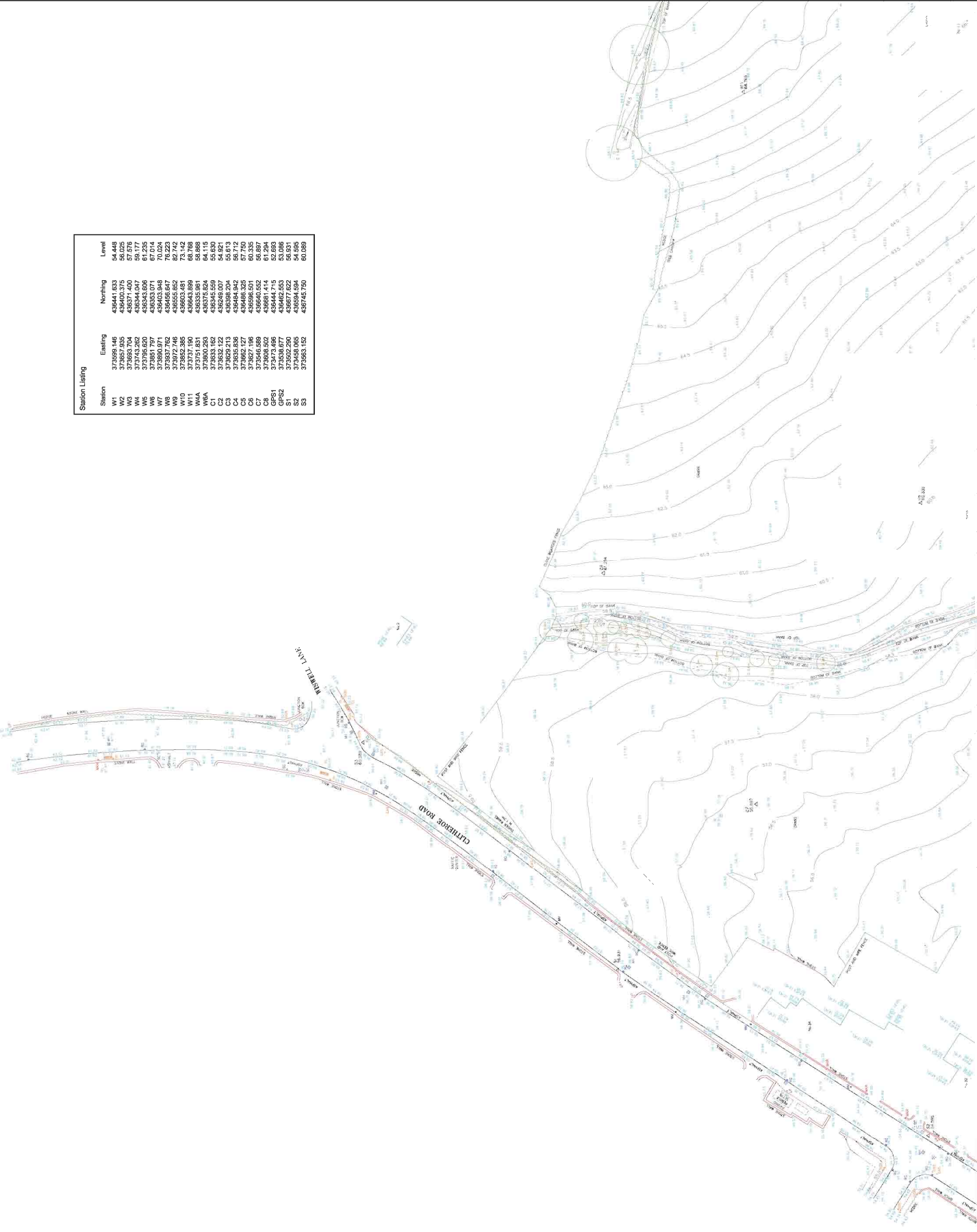
COMMERCIAL ESTATES GROUP

Site
LAND EAST OF CLITHEROE ROAD
WHALLEY, LANCASHIRE

TOPOGRAPHICAL SURVEY

Surveyed	CC, WS	Drawn	CC, WS
CHK.	DA	Date	24/08/2010
Scale	[A1 Sheet] DWG Rev (Layout No)	Status	
1/500	10502-106_2DT (1)	FINAL	
Job No	Rev		
	10502-106		
	Ø		

Station	Station Labeling	Enabling	North	Level
W1	373569.146	438441.533	54.448	
W2	373857.035	438400.375	55.076	
W3	373857.035	438344.240	55.295	
W4	373857.035	438344.240	55.295	
W5	373795.620	438344.240	61.235	
W6	373831.737	438353.071	67.014	
W7	373831.737	438353.071	67.014	
W8	373837.762	438455.662	72.242	
W9	373922.748	438455.662	85.723	
W10	373737.190	438543.389	68.758	
W11	373751.851	438535.981	58.868	
W12	373751.851	438535.981	58.868	
C1	373833.162	438435.549	55.633	
C2	373833.162	438435.549	54.921	
C3	373832.127	438435.549	55.633	
C4	373755.338	438446.262	56.712	
C5	373862.127	438446.262	57.750	
C6	373862.127	438446.262	57.750	
C7	373846.588	438446.262	55.983	
C8	373808.502	438458.114	61.264	
GPS1	373737.466	438444.715	52.693	
GPS2	373837.466	438444.715	52.693	
S1	373802.290	438617.022	56.931	
S2	373848.005	438594.554	54.595	
S3	373850.176	438745.746	60.038	



Notes

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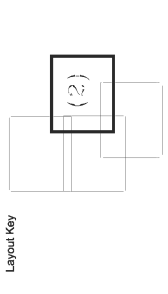




Direction of North



Grid - OS National Grid
Using the OS GPS Network and applying OSTN02 transformation and then removing the scale factor for true distances.
Datum - OS Level Datum
Using the OS GPS Network and applying OSGM02 National Geoid Model to obtain local area corrections.



KEY	
	Spot Height
	Spot Level
	Spot Value
	Spot Datum
	Spot Correction
	Spot Adjustment
	Spot Reduction
	Spot Elevation
	Spot Depression
	Spot Height Difference
	Spot Level Difference
	Spot Value Difference
	Spot Datum Difference
	Spot Correction Difference
	Spot Adjustment Difference
	Spot Reduction Difference
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LS10 1SW

Client

COMMERCIAL ESTATES GROUP

Site

LAND EAST OF CLITHEROE ROAD
WHALLEY, LANCASHIRE

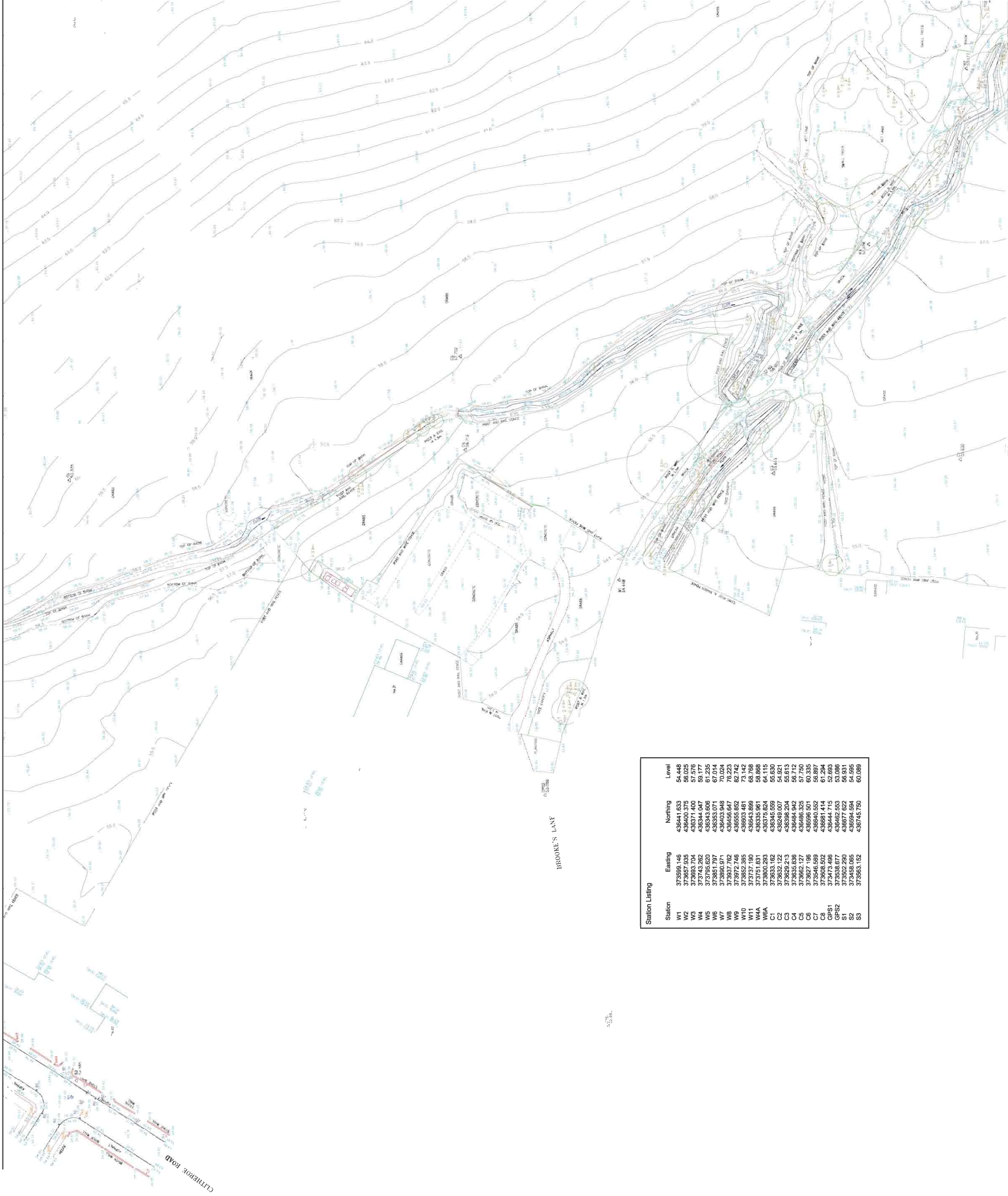
Title

TOPOGRAPHICAL SURVEY
2D

Surveyed	CC, WS	Drawn	CC, WS
CHK.	DA	Date	24/08/2010
Scale	(As Shown)	DWG No (Layout No)	Status
1/500		10502-106_2DT (2)	FINAL
Job No	10502-106	Rev	0



Station Listing	
Station	Easting
W1	375595.146
W2	375557.555
W3	375653.704
W4	375776.620
W5	375851.797
W6	375937.762
W7	376023.727
W8	376109.692
W9	376195.657
W10	376281.622
W11	376367.587
W12	376453.552
W13	376539.517
W14	376625.482
W15	376711.447
W16	376797.412
W17	376883.377
W18	376969.342
W19	377055.307
W20	377141.272
W21	377227.237
W22	377313.202
W23	377399.167
W24	377485.132
W25	377571.097
W26	377657.062
W27	377743.027
W28	377828.992
W29	377914.957
W30	378000.922
W31	378086.887
W32	378172.852
W33	378258.817
W34	378344.782
W35	378430.747
W36	378516.712
W37	378602.677
W38	378688.642
W39	378774.607
W40	378860.572
W41	378946.537
W42	379032.502
W43	379118.467
W44	379204.432
W45	379290.397
W46	379376.362
W47	379462.327
W48	379548.292
W49	379634.257
W50	379720.222
W51	379806.187
W52	379892.152
W53	379978.117
W54	380064.082
W55	380150.047
W56	380236.012
W57	380321.977
W58	380407.942
W59	380493.907
W60	380579.872
W61	380665.837
W62	380751.802
W63	380837.767
W64	380923.732
W65	381009.697
W66	381095.662
W67	381181.627
W68	381267.592
W69	381353.557
W70	381439.522
W71	381525.487
W72	381611.452
W73	381697.417
W74	381783.382
W75	381869.347
W76	381955.312
W77	382041.277
W78	382127.242
W79	382213.207
W80	382299.172
W81	382385.137
W82	382471.102
W83	382557.067
W84	382643.032
W85	382728.997
W86	382814.962
W87	382900.927
W88	382986.892
W89	383072.857
W90	383158.822
W91	383244.787
W92	383330.752
W93	383416.717
W94	383502.682
W95	383588.647
W96	383674.612
W97	383760.577
W98	383846.542
W99	383932.507
W100	384018.472



Station	Lat/Long	Easting	Northing	Level
W1	373599.146	438441.533	55.448	
W2	373687.355	438470.747	56.025	
W3	373693.704	438470.747	57.576	
W4	373693.704	438470.747	57.576	
W5	373795.520	438543.606	61.235	
W6	373811.737	438533.071	67.014	
W7	373811.737	438533.071	67.014	
W8	373837.762	438545.867	82.742	
W9	373972.748	438555.852	85.723	
W10	373972.748	438555.852	85.723	
W11	373737.160	438333.961	68.568	
W12	373751.031	438333.961	68.568	
W13	373823.122	438333.961	68.568	
C1	373832.122	438459.007	55.933	
C2	373832.122	438459.007	54.921	
C3	373828.513	438394.544	55.913	
C4	373828.513	438394.544	55.913	
C5	373862.127	438466.325	60.335	
C6	373827.186	438396.051	60.335	
C7	373827.186	438396.051	60.335	
C8	373838.502	438591.144	61.294	
GPS1	373733.466	438444.715	55.663	
GPS2	373733.466	438444.715	55.663	
GPS3	373802.260	438977.622	56.933	
S1	373585.055	438594.954	54.089	
S2	373585.055	438594.954	54.089	
S3	373655.162	438745.516	60.565	

Rev	Date	Drawn	Description	Check
-	11/1/2000	-	-	-



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Client
COMMERCIAL ESTATES GROUP

Site
LAND EAST OF CLITHEROE ROAD
WHALLEY, LANCASHIRE

Title

TOPOGRAPHICAL SURVEY

2D

Surveyed	CC, WS	Drawn	CC, WS
Chk.	DA	Date	24/08/2010
Scale	[A1 Sheet] 1/500	DWG Ref (Layout No)	10502-106_2DT (3)
Job No	10502-106		
	Rev		
	Ø		

APPENDIX C:

MicroDrainage Outputs for Greenfield Runoff

Weetwood		Page 1
Suite 4 East House Chiltern Avenue Amersham Bucks HP6 5AE	Clitheroe Road, Whalley Greenfield Runoff Rate l/s/ha	
Date 28 September 2010 File	Designed By SC Checked By	
Micro Drainage	Source Control W.12.4	

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	SAAR (mm)	1005	Urban	0.000
Area (ha)	1.000	Soil	0.450	Region Number	Region 10

Results 1/s

QBAR Rural	6.7
QBAR Urban	6.7

Q100 years	14.0
------------	------

Q1 year	5.8
Q30 years	11.4
Q100 years	14.0

APPENDIX D:

MicroDrainage Storage Volume Calculation

Weetwood				Page 1		
Suite 4 East House Chiltern Avenue Amersham Bucks HP6...		Clitheroe Road, Whalley Area A Total Storage 100yrs plus climate c...				
Date 3 December 2010 File 1695 120323 Resi...		Designed by SC/CC Checked by				
Micro Drainage		Source Control W.12.6.1				
<u>Summary of Results for 100 year Return Period (+30%)</u>						
	Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
	15 min Summer	0.292	0.292	5.9	191.8	O K
	30 min Summer	0.402	0.402	5.9	264.2	O K
	60 min Summer	0.527	0.527	5.9	346.4	O K
	120 min Summer	0.655	0.655	5.9	430.7	O K
	180 min Summer	0.723	0.723	5.9	475.4	O K
	240 min Summer	0.766	0.766	5.9	503.2	O K
	360 min Summer	0.819	0.819	5.9	538.5	O K
	480 min Summer	0.848	0.848	5.9	557.1	O K
	600 min Summer	0.862	0.862	5.9	566.2	O K
	720 min Summer	0.866	0.866	5.9	569.2	O K
	960 min Summer	0.867	0.867	5.9	569.5	O K
	1440 min Summer	0.854	0.854	5.9	560.9	O K
	2160 min Summer	0.819	0.819	5.9	538.1	O K
	2880 min Summer	0.777	0.777	5.9	510.8	O K
	4320 min Summer	0.695	0.695	5.9	456.6	O K
	5760 min Summer	0.616	0.616	5.9	404.5	O K
	7200 min Summer	0.538	0.538	5.9	353.7	O K
	8640 min Summer	0.447	0.447	5.9	293.6	O K
	10080 min Summer	0.360	0.360	5.9	236.6	O K
	15 min Winter	0.327	0.327	5.9	215.1	O K
	30 min Winter	0.452	0.452	5.9	296.9	O K
	60 min Winter	0.592	0.592	5.9	389.0	O K
	120 min Winter	0.738	0.738	5.9	484.8	O K
	Storm Event	Rain (mm/hr)		Time-Peak (mins)		
	15 min Summer	110.368		19		
	30 min Summer	76.549		34		
	60 min Summer	50.758		64		
	120 min Summer	32.395		122		
	180 min Summer	24.439		182		
	240 min Summer	19.882		242		
	360 min Summer	14.869		362		
	480 min Summer	12.074		480		
	600 min Summer	10.263		600		
	720 min Summer	8.980		702		
	960 min Summer	7.264		810		
	1440 min Summer	5.374		1068		
	2160 min Summer	3.964		1472		
	2880 min Summer	3.188		1900		
	4320 min Summer	2.346		2724		
	5760 min Summer	1.889		3528		
	7200 min Summer	1.597		4328		
	8640 min Summer	1.393		5104		
	10080 min Summer	1.242		5744		
	15 min Winter	110.368		19		
	30 min Winter	76.549		33		
	60 min Winter	50.758		62		
	120 min Winter	32.395		122		
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Weetwood			Page 2		
Suite 4 East House Chiltern Avenue Amersham Bucks HP6...		Clitheroe Road, Whalley Area A Total Storage 100yrs plus climate c...			
Date 3 December 2010 File 1695 120323 Resi...		Designed by SC/CC Checked by			
Micro Drainage		Source Control W.12.6.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	0.816	0.816	5.9	536.2	O K
240 min Winter	0.865	0.865	5.9	568.8	O K
360 min Winter	0.931	0.931	6.1	611.5	O K
480 min Winter	0.967	0.967	6.2	635.7	O K
600 min Winter	0.988	0.988	6.3	649.3	O K
720 min Winter	0.998	0.998	6.3	656.1	O K
960 min Winter	1.000	1.000	6.3	657.2	O K
1440 min Winter	0.980	0.980	6.2	643.9	O K
2160 min Winter	0.930	0.930	6.1	610.9	O K
2880 min Winter	0.867	0.867	5.9	569.8	O K
4320 min Winter	0.739	0.739	5.9	485.5	O K
5760 min Winter	0.615	0.615	5.9	403.9	O K
7200 min Winter	0.479	0.479	5.9	314.7	O K
8640 min Winter	0.321	0.321	5.9	210.6	O K
10080 min Winter	0.223	0.223	5.9	146.5	O K
Storm Event	Rain (mm/hr)		Time-Peak (mins)		
180 min Winter	24.439		180		
240 min Winter	19.882		238		
360 min Winter	14.869		354		
480 min Winter	12.074		468		
600 min Winter	10.263		580		
720 min Winter	8.980		692		
960 min Winter	7.264		898		
1440 min Winter	5.374		1124		
2160 min Winter	3.964		1596		
2880 min Winter	3.188		2048		
4320 min Winter	2.346		2940		
5760 min Winter	1.889		3808		
7200 min Winter	1.597		4688		
8640 min Winter	1.393		5192		
10080 min Winter	1.242		5744		
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Weetwood		Page 3																												
Suite 4 East House Chiltern Avenue Amersham Bucks HP6...	Clitheroe Road, Whalley Area A Total Storage 100yrs plus climate c...																													
Date 3 December 2010 File 1695 120323 Resi...	Designed by SC/CC Checked by																													
Micro Drainage Source Control W.12.6.1																														
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.300</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.291</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+30</td> </tr> </table> <u>Time / Area Diagram</u> Total Area (ha) 0.946 <table> <thead> <tr> <th>Time (mins)</th> <th>Area (ha)</th> </tr> </thead> <tbody> <tr> <td>0-4</td> <td>0.946</td> </tr> </tbody> </table>			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)	19.300	Shortest Storm (mins)	15	Ratio R	0.291	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+30	Time (mins)	Area (ha)	0-4	0.946
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Weetwood		Page 4																																																																																																																																									
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<u>Model Details</u> Storage is Online Cover Level (m) 1.500 <u>Tank or Pond Structure</u> Invert Level (m) 0.000 <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> <th>Depth (m)</th> <th>Area (m²)</th> </tr> </thead> <tbody> <tr><td>0.000</td><td>657.2</td><td>1.400</td><td>657.2</td><td>2.800</td><td>657.2</td><td>4.200</td><td>657.2</td></tr> <tr><td>0.200</td><td>657.2</td><td>1.600</td><td>657.2</td><td>3.000</td><td>657.2</td><td>4.400</td><td>657.2</td></tr> <tr><td>0.400</td><td>657.2</td><td>1.800</td><td>657.2</td><td>3.200</td><td>657.2</td><td>4.600</td><td>657.2</td></tr> <tr><td>0.600</td><td>657.2</td><td>2.000</td><td>657.2</td><td>3.400</td><td>657.2</td><td>4.800</td><td>657.2</td></tr> <tr><td>0.800</td><td>657.2</td><td>2.200</td><td>657.2</td><td>3.600</td><td>657.2</td><td>5.000</td><td>657.2</td></tr> <tr><td>1.000</td><td>657.2</td><td>2.400</td><td>657.2</td><td>3.800</td><td>657.2</td><td></td><td></td></tr> <tr><td>1.200</td><td>657.2</td><td>2.600</td><td>657.2</td><td>4.000</td><td>657.2</td><td></td><td></td></tr> </tbody> </table> <u>Hydro-Brake® Outflow Control</u> Design Head (m) 1.000 Hydro-Brake® Type Md13 Invert Level (m) 0.000 Design Flow (l/s) 6.3 Diameter (mm) n/a <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> </tr> </thead> <tbody> <tr><td>0.100</td><td>4.0</td><td>1.200</td><td>6.9</td><td>3.000</td><td>10.8</td><td>7.000</td><td>16.4</td></tr> <tr><td>0.200</td><td>5.9</td><td>1.400</td><td>7.4</td><td>3.500</td><td>11.6</td><td>7.500</td><td>17.0</td></tr> <tr><td>0.300</td><td>5.6</td><td>1.600</td><td>7.9</td><td>4.000</td><td>12.4</td><td>8.000</td><td>17.6</td></tr> <tr><td>0.400</td><td>5.2</td><td>1.800</td><td>8.3</td><td>4.500</td><td>13.2</td><td>8.500</td><td>18.1</td></tr> <tr><td>0.500</td><td>4.7</td><td>2.000</td><td>8.8</td><td>5.000</td><td>13.9</td><td>9.000</td><td>18.6</td></tr> <tr><td>0.600</td><td>5.0</td><td>2.200</td><td>9.2</td><td>5.500</td><td>14.6</td><td>9.500</td><td>19.1</td></tr> <tr><td>0.800</td><td>5.7</td><td>2.400</td><td>9.6</td><td>6.000</td><td>15.2</td><td></td><td></td></tr> <tr><td>1.000</td><td>6.3</td><td>2.600</td><td>10.0</td><td>6.500</td><td>15.8</td><td></td><td></td></tr> </tbody> </table>				Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	0.000	657.2	1.400	657.2	2.800	657.2	4.200	657.2	0.200	657.2	1.600	657.2	3.000	657.2	4.400	657.2	0.400	657.2	1.800	657.2	3.200	657.2	4.600	657.2	0.600	657.2	2.000	657.2	3.400	657.2	4.800	657.2	0.800	657.2	2.200	657.2	3.600	657.2	5.000	657.2	1.000	657.2	2.400	657.2	3.800	657.2			1.200	657.2	2.600	657.2	4.000	657.2			Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	4.0	1.200	6.9	3.000	10.8	7.000	16.4	0.200	5.9	1.400	7.4	3.500	11.6	7.500	17.0	0.300	5.6	1.600	7.9	4.000	12.4	8.000	17.6	0.400	5.2	1.800	8.3	4.500	13.2	8.500	18.1	0.500	4.7	2.000	8.8	5.000	13.9	9.000	18.6	0.600	5.0	2.200	9.2	5.500	14.6	9.500	19.1	0.800	5.7	2.400	9.6	6.000	15.2			1.000	6.3	2.600	10.0	6.500	15.8		
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Summer</td><td>0.861</td><td>0.861</td><td>4.3</td><td>405.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>0.866</td><td>0.866</td><td>4.3</td><td>407.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>0.867</td><td>0.867</td><td>4.3</td><td>408.1</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>0.854</td><td>0.854</td><td>4.3</td><td>402.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>0.820</td><td>0.820</td><td>4.2</td><td>386.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.780</td><td>0.780</td><td>4.1</td><td>367.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.701</td><td>0.701</td><td>4.0</td><td>330.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.626</td><td>0.626</td><td>4.0</td><td>294.9</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.555</td><td>0.555</td><td>4.0</td><td>261.6</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.486</td><td>0.486</td><td>4.0</td><td>228.8</td><td>O K</td></tr><tr><td>10080 min 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Summer</td><td colspan="2">19.882</td><td colspan="2">242</td></tr><tr><td>360 min Summer</td><td colspan="2">14.869</td><td colspan="2">362</td></tr><tr><td>480 min Summer</td><td colspan="2">12.074</td><td colspan="2">480</td></tr><tr><td>600 min Summer</td><td colspan="2">10.263</td><td colspan="2">600</td></tr><tr><td>720 min Summer</td><td colspan="2">8.980</td><td colspan="2">700</td></tr><tr><td>960 min Summer</td><td colspan="2">7.264</td><td colspan="2">808</td></tr><tr><td>1440 min Summer</td><td colspan="2">5.374</td><td colspan="2">1064</td></tr><tr><td>2160 min Summer</td><td colspan="2">3.964</td><td colspan="2">1472</td></tr><tr><td>2880 min Summer</td><td colspan="2">3.188</td><td colspan="2">1900</td></tr><tr><td>4320 min Summer</td><td colspan="2">2.346</td><td colspan="2">2724</td></tr><tr><td>5760 min Summer</td><td colspan="2">1.889</td><td colspan="2">3520</td></tr><tr><td>7200 min Summer</td><td colspan="2">1.597</td><td colspan="2">4328</td></tr><tr><td>8640 min Summer</td><td colspan="2">1.393</td><td colspan="2">5184</td></tr><tr><td>10080 min Summer</td><td colspan="2">1.242</td><td colspan="2">5944</td></tr><tr><td>15 min Winter</td><td colspan="2">110.368</td><td colspan="2">19</td></tr><tr><td>30 min Winter</td><td colspan="2">76.549</td><td colspan="2">33</td></tr><tr><td>60 min Winter</td><td colspan="2">50.758</td><td colspan="2">62</td></tr><tr><td>120 min Winter</td><td colspan="2">32.395</td><td colspan="2">122</td></tr></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	0.292	0.292	4.0	137.7	O K	30 min Summer	0.403	0.403	4.0	189.9	O K	60 min Summer	0.528	0.528	4.0	248.7	O K	120 min Summer	0.656	0.656	4.0	309.1	O K	180 min Summer	0.724	0.724	4.0	341.1	O K	240 min Summer	0.766	0.766	4.0	360.9	O K	360 min Summer	0.820	0.820	4.2	386.1	O K	480 min Summer	0.848	0.848	4.2	399.3	O K	600 min Summer	0.861	0.861	4.3	405.7	O K	720 min Summer	0.866	0.866	4.3	407.7	O K	960 min Summer	0.867	0.867	4.3	408.1	O K	1440 min Summer	0.854	0.854	4.3	402.2	O K	2160 min Summer	0.820	0.820	4.2	386.3	O K	2880 min Summer	0.780	0.780	4.1	367.4	O K	4320 min Summer	0.701	0.701	4.0	330.1	O K	5760 min Summer	0.626	0.626	4.0	294.9	O K	7200 min Summer	0.555	0.555	4.0	261.6	O K	8640 min Summer	0.486	0.486	4.0	228.8	O K	10080 min Summer	0.402	0.402	4.0	189.5	O K	15 min Winter	0.328	0.328	4.0	154.5	O K	30 min Winter	0.453	0.453	4.0	213.3	O K	60 min Winter	0.593	0.593	4.0	279.3	O K	120 min Winter	0.739	0.739	4.0	348.0	O K	Storm Event	Rain (mm/hr)		Time-Peak (mins)		15 min Summer	110.368		19		30 min Summer	76.549		34		60 min Summer	50.758		64		120 min Summer	32.395		122		180 min Summer	24.439		182		240 min Summer	19.882		242		360 min Summer	14.869		362		480 min Summer	12.074		480		600 min Summer	10.263		600		720 min Summer	8.980		700		960 min Summer	7.264		808		1440 min Summer	5.374		1064		2160 min Summer	3.964		1472		2880 min Summer	3.188		1900		4320 min Summer	2.346		2724		5760 min Summer	1.889		3520		7200 min Summer	1.597		4328		8640 min Summer	1.393		5184		10080 min Summer	1.242		5944		15 min Winter	110.368		19		30 min Winter	76.549		33		60 min Winter	50.758		62		120 min Winter	32.395		122	
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8640 min Summer	1.393		5184																																																																																																																																																																																																																																																																											
10080 min Summer	1.242		5944																																																																																																																																																																																																																																																																											
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30 min Winter	76.549		33																																																																																																																																																																																																																																																																											
60 min Winter	50.758		62																																																																																																																																																																																																																																																																											
120 min Winter	32.395		122																																																																																																																																																																																																																																																																											
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Weetwood			Page 2		
Suite 4 East House Chiltern Avenue Amersham Bucks HP6...		Clitheroe Road, Whalley Area A Total Storage 100yrs plus climate c...			
Date 3 December 2010 File 1695 120323 Resi...		Designed by SC/CC Checked by			
Micro Drainage		Source Control W.12.6.1			
<u>Summary of Results for 100 year Return Period (+30%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
180 min Winter	0.817	0.817	4.2	384.8	O K
240 min Winter	0.867	0.867	4.3	408.2	O K
360 min Winter	0.931	0.931	4.4	438.7	O K
480 min Winter	0.968	0.968	4.5	456.0	O K
600 min Winter	0.989	0.989	4.6	465.6	O K
720 min Winter	0.999	0.999	4.6	470.4	O K
960 min Winter	1.000	1.000	4.6	471.1	O K
1440 min Winter	0.981	0.981	4.5	462.2	O K
2160 min Winter	0.933	0.933	4.4	439.3	O K
2880 min Winter	0.872	0.872	4.3	410.7	O K
4320 min Winter	0.750	0.750	4.0	353.1	O K
5760 min Winter	0.634	0.634	4.0	298.8	O K
7200 min Winter	0.522	0.522	4.0	245.7	O K
8640 min Winter	0.372	0.372	4.0	175.2	O K
10080 min Winter	0.253	0.253	4.0	119.0	O K
Storm Event	Rain (mm/hr)		Time-Peak (mins)		
180 min Winter	24.439		180		
240 min Winter	19.882		238		
360 min Winter	14.869		354		
480 min Winter	12.074		468		
600 min Winter	10.263		580		
720 min Winter	8.980		690		
960 min Winter	7.264		896		
1440 min Winter	5.374		1122		
2160 min Winter	3.964		1580		
2880 min Winter	3.188		2048		
4320 min Winter	2.346		2940		
5760 min Winter	1.889		3808		
7200 min Winter	1.597		4680		
8640 min Winter	1.393		5368		
10080 min Winter	1.242		5856		
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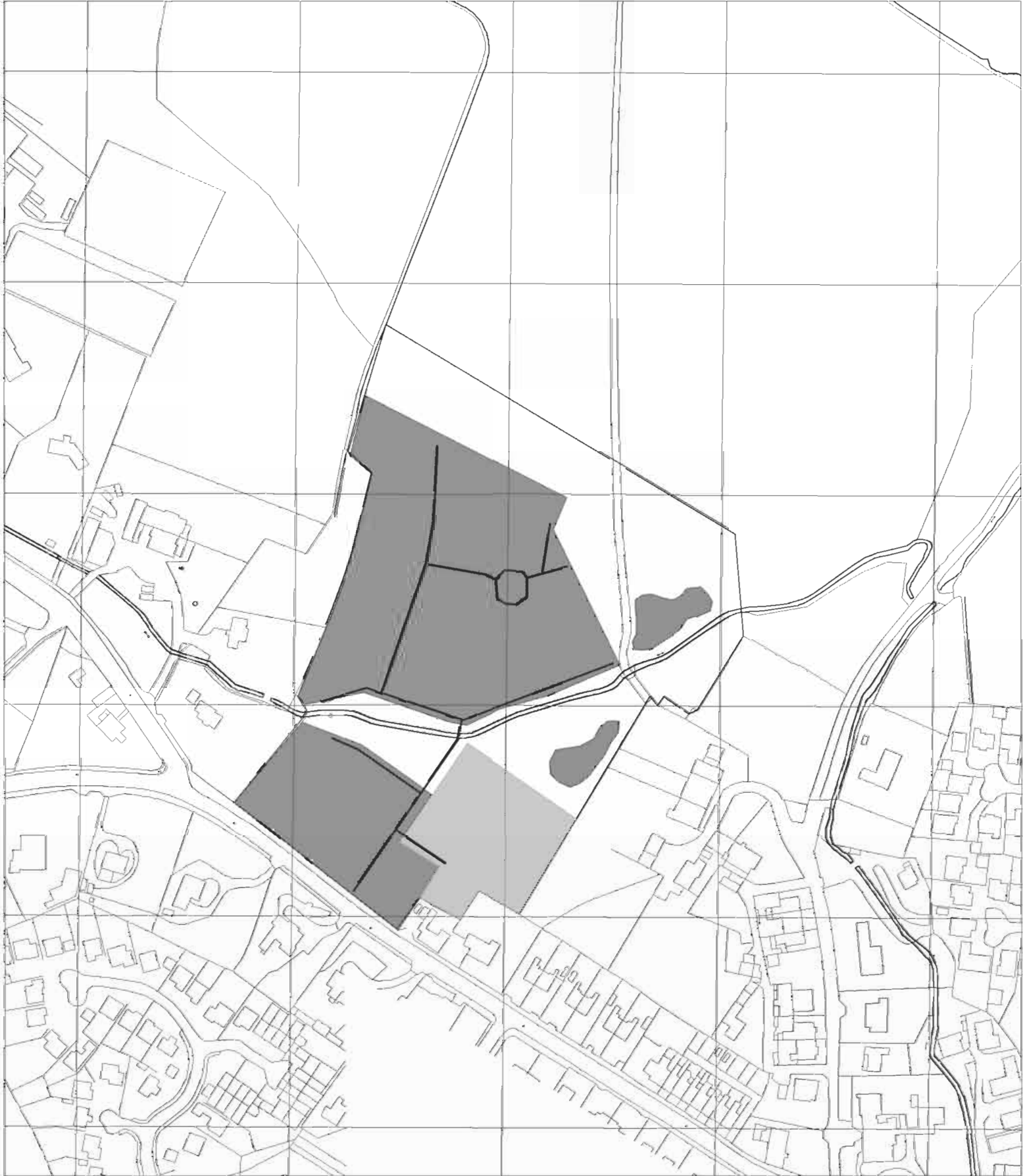
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APPENDIX E:

Indicative Surface Water Drainage Strategy



Notes:

1. Do not scale from this drawing.
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KEY:

- Site Boundary
- Residential
- Nursing Home
- Storage Facility



No. 2 Smithy Farm
Chapel Lane
Bruera
Chester CH3 6EW

Tel: 01244 677060
Email: info@weetwood.net

Client:

Commercial Estates Group

Project Title:

Land East of Clitheroe Road, Whalley

Drawing Title:

Indicative Surface Water Drainage Strategy

Map Orientation:



Drawn:

RE

Checked:

AG

Date:

26 March 2012

Drawing No:

1695_SWD Strat

Rev:

B

APPENDIX F:

Public Sewer Records



There are no nodes in SD7436NW.

WASTE WATER SYMBOLOGY	
	MANHOLE
	SIDE ENTRY
	INLET/OUTLET
	SANITARY SEWER
	PRIVATE SEWER
	AVALLANCE
	CURB/GUTTER
	CONTROL VALVE
	GULLY
	HYDROXIDE
	NET
	GAST NODE (N) (On Rising Main, On Dual Function)
	EXPENDABLE NODE (X) (CHARGE OF CHARACTERISTICS)
	CATCHMENT
	CHAMBER
	DROPSHAFT
	SHEET PILE
	OVERLOW
	PAVING
	SLOPE LINING STATION
	TRANSITION
	UNSPECIFIED
Note: ALL flow direction arrows are BLUE - colour not significant	
NODE TABLE ABBREVIATIONS	
MANHOLE FUNCTION	
S Surface	T Transition
F Flood	O Overflow
C Confined	U Unspecified
MANHOLE NODE TYPE	
M Manhole	Z Ghost in Rising Main
J Junction	C Cesspide
H Hachbox	E Ejector
R Rotating Eye	O Oil Injector
V Combined Sewer	B Hydraulic
P Overflow	T Vent Column
U Unspecified	U Unspecified
S Sewerway	X Expendable Node
D Dual Function	G Gas Node
W Treatment Works	G (to allow pipe bends)
SEWER SHAPE	
C Circular	T Triangular
O Oval	B Barrel
F Flat Top	H Horseshoe
S Square	U Unspecified
SEWER MATERIAL	
AC Asbestos Cement	
C Cast Iron	
SI Spun Grey Iron	
CS Concrete Segments (Reinforced)	
CS Concrete Segments (Unreinforced)	
D Ductile Iron	
GR Glass Reinforced Concrete	
PS Plastic Steel Composite	
PV Polyvinyl Chloride	
RP Reinforced Plastic Matrix	
ST Steel	
WC Wrought City (All Clayware)	
PP Plastic	
MA Masonry - in Regular Courses	
MA Masonry - in Irregular Courses	
U Unspecified	



United

utilities

SEWER RECORDS

OS Sheet No: SD7436NW

 Scale 1:1250 Date: 16-Sep-2010

 No Nodes

 Sheet 1 of 1

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OS Sheet No: SD7436SW
Scale 1:1250 Date: 16-Sep-2010
No Nodes
Sheet 1 of 1

WASTE WATER SYMOLOGY

	TOOL		SURFACE		CONTAINED		MANHOLE
	SEWER		MANHOLE		SIDE ENTRY		SEWER
	SEWER		SEWER		SEWER		SEWER
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APPENDIX G:

United Utilities Letter Dated 20 December 2011

Ribble Valley Borough Council
Council Officers, Church Walk
Clitheroe
BB7 2RA

Direct Line 01925 678308
Planning Liaison@uuplc.co.uk

Your ref	3/2011/0111
Our ref	DC/11/5196
Date	20-DEC-11

Dear Sir/Madam,

Location : Land to east of Clitheroe Road (Lawsonsteads) Whalley
Proposal : Mixed use of development Nursing Home, Primary School, car parking, landscaping

Thank you for your planning consultation of 14/12/11.

This response is based on the details submitted on the planning application form; any changes to the planning application will invalidate this response

On the basis of the information currently available and the currently committed development in the catchment for Whalley Wastewater Treatment Works, UU confirms that it has **no objection** on capacity grounds to the proposed development by Commercial Estates Group subject to the attachment of the following conditions:

1 The site must be drained on a separate system with only foul drainage connecting into the public sewer. No surface water shall be allowed to drain into the public sewer.

2 Unless otherwise agreed in writing by the local planning authority no part of the development other than:

- a) 222 dwelling units (Use Class C3); or
- b) 161 dwelling units (Use Class C3) and the proposed nursing home (Use Class C2)

shall be occupied before the date which is 54 months (being four years and six months) from the date of this planning permission

Reason: To allow the sewerage undertaker to address capacity at the Whalley Wastewater Treatment Works and the capacity of the sewer network serving the development and feeding into the Whalley Wastewater Treatment Works

3 (a) Prior to the commencement of development of each phase, a scheme for foul and surface water drainage for that phase shall be submitted to the local planning authority and agreed in writing; and

(b) Each drainage scheme submitted pursuant to 3(a) above shall ensure that the foul water flows from the development as a whole shall not exceed a rate of 4 litres per second until the date specified in Condition [2] above, unless otherwise agreed in writing with the local planning authority; and

(c) For each phase of the development the foul and surface water drainage scheme shall be implemented in accordance with the approved details unless otherwise agreed in writing with the local planning authority

Yours Faithfully,

Lorna Church
Asset Protection
United Utilities