



**Appendix 3.1
EIA Scoping Report**

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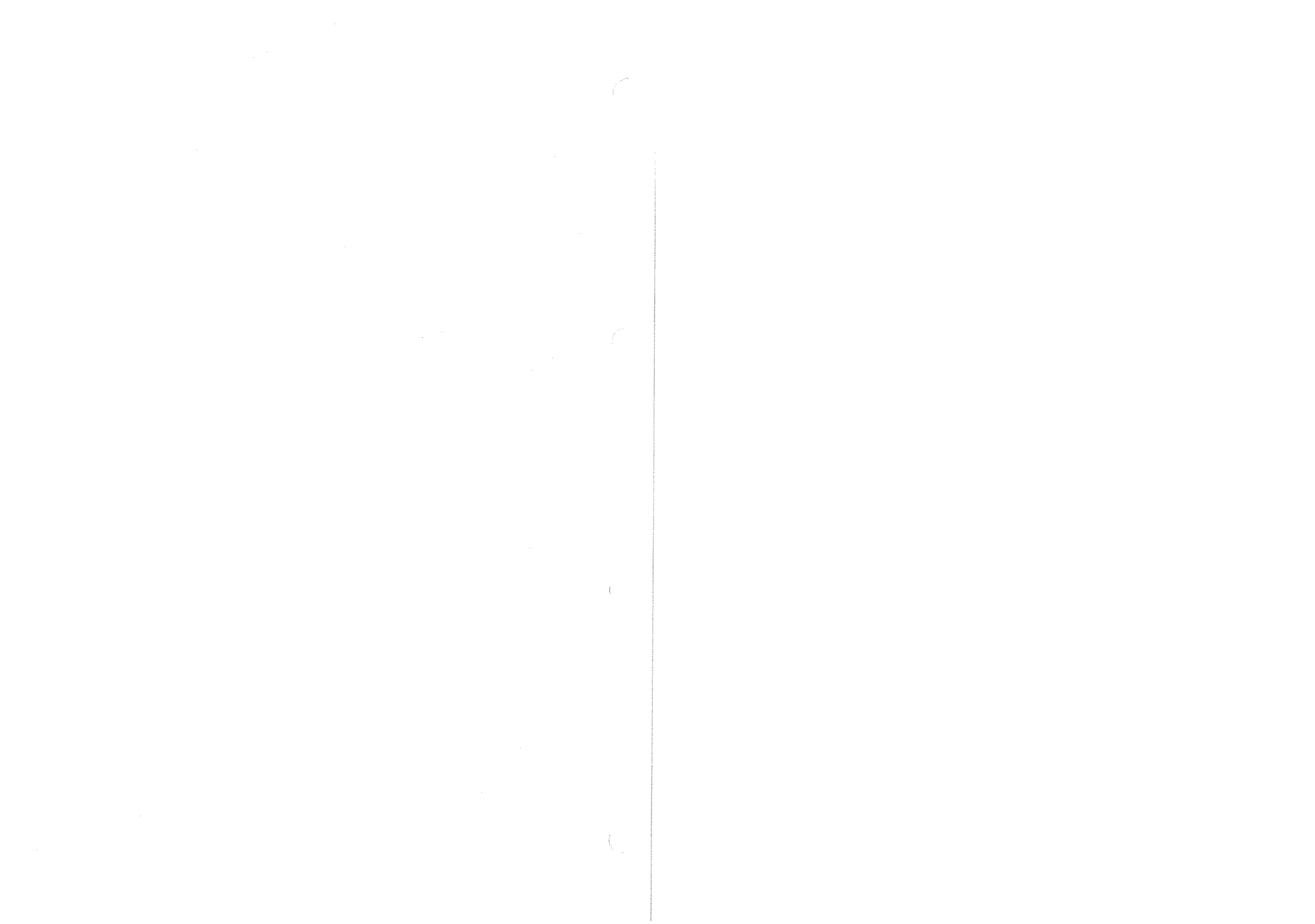
Trustees of the Standen Estate

Land South of Clitheroe

EIA Scoping Report

5 October 2011

AMEC Environment & Infrastructure UK Limited





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**Trustees of the
Standen Estate****Land South of
Clitheroe**

EIA Scoping Report

5 October 2011

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Land South of Clitheroe: Scoping Report for Environmental Impact Assessment

1. Introduction

AMEC Environment & Infrastructure UK Ltd (AMEC) has been instructed by Steven Abbott Associates LLP (SAA), on behalf of the Trustees of the Standen Estate, to prepare a Scoping Report to support any future planning application for a predominantly residential development, but also providing space for business uses (Class B1), a primary school, open space and infrastructure on land to the south of Clitheroe, in the Ribble Valley.

Our client has endorsed SAA's view that the nature of the development means that an Environmental Impact Assessment (EIA) would be beneficial to assist with the consideration of a future planning application. The results of the EIA would be presented in an Environmental Statement (ES).

This report presents a request to Ribble Valley Borough Council for a 'scoping opinion' under Regulation 10 the *Town and Country Planning (Environmental Impact Assessment) Regulations 2011* hereinafter referred to as the EIA Regulations. The report identifies the potential significant effects of the development that need to be considered in depth as part of the EIA and the proposed scope of the assessment in relation to these effects (insofar as this scope can be determined at this early stage in the EIA process). It is hoped that this information will provide a basis for agreement to be reached over the approach to be taken in preparing the ES.

1.1 Purpose of the Report

The ES is required to describe the likely significant environmental effects of the proposed development and evaluate their significance using clearly defined criteria. The findings are then available to assist decision-makers in determining the planning application and drafting the planning conditions. However, before the ES is produced, the EIA must fulfil other important purposes, notably:

- At the outset, it should consider the reasons for the development and any alternatives considered;
- It should identify opportunities to modify the design of the scheme to:
 - avoid or reduce adverse effects, with a focus on those effects that are likely to be significant;
 - increase the environmental benefits through environmental enhancements;



- Where significant adverse effects are unavoidable, consideration should be given to the opportunities to implement measures that will, at least in part, compensate for the effects.

EIA is an iterative 'process' that is used to help refine a scheme, with the objectives of reducing any adverse environmental effects that could be caused by the development and increasing its positive effects. At stages in the process, mitigation and enhancement opportunities may be identified as defined by Box 1.1.

<p>Box 1.1 Definitions of Mitigation and Enhancement</p>
<p>Mitigation</p> <p>Mitigation may comprise.</p> <ul style="list-style-type: none"> • Avoidance: Measures taken to avoid adverse effects. • Reduction: Measures taken to reduce adverse effects. • Compensation: Measures taken to offset/compensate for significant adverse effects. These usually take the form of attempting to replace what will be lost.
<p>Enhancement</p> <p>The genuine enhancement of environmental interests, unrelated to any avoidance, reduction or compensation, is not considered to be mitigation. However, it will still be relevant to the ES if it is proposed as part of the development.</p>

1.2 The Applicant

The applicants are the Trustees of the Standen Estate.



2. The Proposed Development

2.1 Location

The location of the proposed development is shown on Figure 1. It is centred on National Grid Reference (NGR) SD374850 440689. The site was included within the Ribble Valley Borough Council (RVBC) document *Core Strategy – Generation of Alternative Development Strategy Options* (June 2011) as 'Option D'.

The site is bordered to the north by the southern outskirts of Clitheroe, to the east by Pendle Road, to the south by the Worston Old Road minor road and Pendleton Brook, a small tributary of the River Ribble, and to the west by Littlemoor. The A671 and A59 lie beyond the western and southern boundaries respectively.

The site occupies an area of approximately (~) 51.3 hectares (ha) of agricultural land predominantly used for grazing and mowing purposes separated into a number of medium to large sized fields bound by hedgerows with individual hedgerow trees. Two public rights of way (PRoW) cross the site, towards the western and eastern boundaries respectively, and Ordnance Survey maps show the course of a Roman Road traverses the western part of the site in a northeast-southwest direction. Drainage ditches border the site to the north, and a wood surrounds Standen Hall to the south.

2.2 The Development Proposals

The RVBC *Core Strategy Consultation* document sets out the following key statement with respect to housing provision in the Borough:

'KEY STATEMENT: HOUSING PROVISION

Land for residential development will be made available for an average annual completion rate of at least 161 dwellings per year in accordance with baseline information.

The Council will identify through the Strategic Housing Land Availability Study, sites for residential development that are deliverable over a five-year period. By reference to the housing land monitoring report and where appropriate Strategic Housing Land Availability Assessments, the Council will endeavour to ensure housing land is identified for the full 15 year period and beyond.'

As noted in Section 2.1, the site of the proposed development was included as an 'Alternative Option' for development in the *Core Strategy – Generation of Alternative Development Strategy Options* document for the provision of housing and other economic development within the Borough. The proposed development would predominantly comprise residential properties, with some business uses also proposed towards the northeastern part of the site. It is also proposed to include public open space and amenity areas, as well as land for a primary school if



required, within the site. Whilst the site layout has yet to be finalised, a preliminary masterplan has been produced (see Appendix A) which shows the potential layout of the development.

The site has good potential access to the transport network. A new access would be created on to Pendle Road to the northeast, which has direct access on to the A59 within a short distance to the south. This access on to the A59 would be improved as part of the development with details to be agreed with the local Highways Authority. A further new access point would be created to the northwest of the development on to Littlemoor, which has a direct link on to the A671 (Whalley Road)

The development has the potential to provide benefits to the local area through the generation of skilled employment, together with the wider economic gain through the need for local products and services throughout the construction phase. The proposals for business development as part of the scheme would provide new job opportunities within the area. The new housing proposals would provide a significant proportion of the housing need identified in the RVBC Core Strategy documents, as well as a high quality development for new residents.

When submitted, the planning application would also include an outline of the contents of the waste management plan for the site following its regeneration.

2.2.1 Alternatives

The ES will describe the alternatives to the proposed development considered by the applicant as well as the alternative options for the site design that have been considered

3. Approach to the EIA

3.1 Legislative Requirements

Annex C to Circular 2/1999 summarises the information to be included in an ES based on Schedule 4 of the EIA Regulations. In short, the information comprises:

- A description of the development;
- An outline of the main alternatives to the development;
- A description of the aspects of the environment likely to be significantly affected by the development;
- A description of the measures to prevent, reduce and where possible offset, any significant adverse effects on the environment.

Information will be collated by technical area ensuring a comprehensive assessment of the potentially significant effects

3.2 Assessment Approach

At this stage and subject to changes in policy and best practice it is envisaged that an EIA would consider and set out the following:

- **Introduction;**
- **Context:** This provides a 'pen-picture' of the relevance of each environmental topic and includes details of the terminology and technical and planning context relevant to technical discipline;
- **Assessment Approach:** This summarises the data gathering and survey work that was undertaken to inform the proposed scope of the EIA;
- **Baseline Conditions:** This provides a detailed description of the receptors and draws conclusions in respect of their sensitivity or value based on the evaluation of relevant criteria;
- **Proposed Mitigation:** This section deals primarily with the ways in which the scheme design has been modified to avoid or reduce the effects that could potentially be significant during the key phases of the development. Measures designed to compensate for or offset likely significant effects are also provided;
- **Assessment of Effects:** The results of the detailed assessment are described in this section and are related to each of the receptors. It therefore takes account of the sensitivity (or value) attributed to a particular receptor and relates to it the predicted magnitude of environmental change from the various development-related activities. Information about the effects of all the environmental changes is



then drawn together and a conclusion reached about the overall effect, as to whether it is “significant” or “not significant”;

- **Conclusions:** This concludes the overall findings of the assessment in respect of the environmental topic or specific receptors. This is demonstrated in tabular form and summarises the predicted effects in relation to each receptor. It therefore provides a useful checking device to the findings of the preceding detailed assessments, which has determined whether the effects are “significant” or “not significant” as defined by the EIA Regulations.

3.3 Technical Scope

The technical scope of the EIA will be reviewed throughout the project development stage and will be informed by the responses to this scoping report. Should changes in scope occur then these will be discussed and agreed with consultees. It is not the intention to reissue this scoping report but instead to report on any changes in the main body of the ES.



4. Policy and Legislation

4.1 National Planning Policy

The ES will include a review of key policies (national, regional and local), that will need to be addressed as part of the EIA. The focus will be on those policies that may influence the assessment of effects and the weight given to land-use designations. The review of national planning policy will focus on the following:

- Planning Policy Statement 1 (PPS 1) *Delivering Sustainable Development* (2005);
- Planning Policy Guidance Note 2 (PPG 2) *Green Belts* (1995);
- PPS 3 *Housing* (2006 and as subsequently amended);
- PPS 4 *Planning for Sustainable Growth* (2010 and subsequent related Ministerial Statements and letters);
- PPS 5 *Planning for the Historic Environment* (2010);
- PPS 7 *Sustainable Development in Rural Areas* (2004);
- PPS 9 *Biodiversity and Geological Conservation* (2005);
- PPS 11 *Regional Spatial Strategies* (2004);
- PPG 13 *Transport* (2001);
- PPG17 *Planning for Open Space, Sport and Recreation* (2002);
- PPS 23 *Planning and Pollution Control* (2004);
- PPG 24 *Planning and Noise* (1994);
- PPS 25 *Development and Flood Risk* (2006)

4.1.1 National Planning Policy Framework

On 25 July 2011 the UK Government published its draft National Planning Policy Framework (NPPF) for England which will replace all current Planning Policy Statements and Guidance Notes. Once adopted, local planning authorities will need to ensure that planning decisions are made in accordance with this overriding national planning policy guidance. The draft is open for consultation until 17 October 2011 and is expected to be in place by the end of 2011.

4.2 Regional Policy

In addition to the national planning policy framework, it will also be important to undertake a thorough review of existing regional planning policy



Currently the Regional Spatial Strategy (RSS) for the North West of England forms part of the Development Plan. The RSS was first published in September 2008 and set out the planning strategy for the North West region up to 2021.

All regional planning guidance documents were revoked by the Secretary of State for Communities and Local Government with immediate effect on 06 July 2010. This decision was however later quashed in the High Court, and therefore the RSS currently remains as part of the development plan.

4.3 Strategic and Local Policy

The strategic and local planning policy framework is provided by the following:

Adopted Plans

- The Ribble Valley Districtwide Local Plan (1998);
- Joint Lancashire Structure Plan - Supplementary Planning Guidance: Access and Parking (2006);
- Joint Lancashire Structure Plan - Supplementary Planning Guidance: Landscape and Heritage (2006).

When the RSS was adopted on 30 September 2008, the Joint Lancashire Structure Plan ceased to be part of the Development Plan, with the exception of Policy 29 *Sites for Gypsy and Traveller Families* (of no relevance to the proposed development), and the two SPGs noted above.

Key environmental policies from the Local Plan that were saved as part of the Local Development Framework (LDF) process (discussed further following Table 4.1) that will be of relevance are set out in Table 4.1. It should be noted that this is not intended to be a definitive list of all the policies that will need to be considered. Rather, it seeks to highlight the most relevant policy considerations for the EIA.



Table 4.1 Summary of Relevant Development Plan Environmental Policies

Policy Ref.	Summary of Policy Provisions
Ribble Valley Districtwide Local Plan	
Policy ENV1 <i>Area of Outstanding Natural Beauty</i>	The landscape and character of the Forest of Bowland Area of Outstanding Natural Beauty will be protected, conserved and enhanced. In addition development will also need to contribute to the conservation of the natural beauty of the area. The environmental effects of proposals will be a major consideration and the design, materials, scale, massing and landscaping of development will be important factors in deciding planning applications (see Policy G1).
Policy ENV2 <i>Forest of Bowland</i>	The landscape and character of those areas immediately adjacent to the Forest of Bowland Area of Outstanding Natural Beauty will be protected, conserved and wherever possible enhanced. The environmental effects of proposals will be a major consideration and the design, materials, scale, massing and landscaping of development will be important factors in deciding planning applications (see Policy G1).
Policy ENV3 <i>Open Countryside</i>	In the open countryside outside the AONB and areas immediately adjacent to it, development will be required to be in keeping with the character of the landscape area and should reflect local vernacular, scale, style, features and building materials. Proposals to conserve, renew and enhance landscape features, will be permitted, providing regard has been given for the characteristic landscape features of the area.
Policies ENV6 <i>Agricultural Land</i>	The Borough Council will safeguard the best and most versatile agricultural land (as classified by the Ministry of Agriculture) unless it can be shown that the need for development overrides agricultural considerations.
Policy ENV7 <i>Species Protection</i>	Development proposals which would have an adverse effect on wildlife species protected by law will not be granted planning permission, unless arrangements can be made through planning conditions or agreements to secure the protection of the species
Policy ENV8 <i>Sites of Special Scientific Interest</i>	Development proposals likely to adversely affect the nature conservation of Sites of Special Scientific Interest will not be permitted unless it can be demonstrated that other material considerations outweigh the special interest of the site
Policy ENV9 <i>Other Important Wildlife Sites</i>	Development proposals within or adjacent to a County Biological Heritage Site or other site of local nature conservation importance identified on the proposals map will be permitted provided the development would not significantly harm the features.
Policy ENV10 <i>Nature Conservation</i>	<p>Where permission is granted for development affecting the nature conservation value of sites, including those referred to in Policies ENV8 and ENV9, conditions may be imposed or agreements sought:</p> <ul style="list-style-type: none"> (a) to avoid damage to wildlife habitats or physical features of the nature conservation interest; (b) to secure the retention or enhancement of wildlife habitats; and (c) in appropriate cases, to require the re-creation of habitats once the development has ceased.

Table 4.1 (continued) Summary of Relevant Development Plan Environmental Policies

Policy Ref.	Summary of Policy Provisions
Ribble Valley Districtwide Local Plan	
Policy ENV13 <i>Landscape Protection</i>	The Borough Council will refuse development proposals which harm important landscape features including traditional stone walls, ponds, characteristic herb rich meadows and pastures, woodlands, copses, hedgerows and individual trees other than in exceptional circumstances where satisfactory works of mitigation or enhancement would be achieved, including rebuilding, replanting and landscape management.
Policy ENV14 <i>Archaeological and Historic Heritage</i>	In considering development proposals, the Borough Council will apply a presumption in favour of the preservation of ancient monuments and other nationally important archaeological remains and their settings. The case for preservation of archaeological remains will be assessed having regard to the intrinsic importance of the remains which will be weighed against the need for the proposed development.

As well as the Environmental policies outlined in Table 4.1, the following policies will also be of relevance to the EIA:

- Policy G1 (General): Development Control;
- Policy G2: Wilshire, Clitheroe, Billington, Longridge and Whalley;
- Policy G6: Essential Open Space;
- Policy G11: Crime Prevention;
- Policy H2 (Housing): Dwellings in the Open Countryside;
- Policy H19: Housing Needs – Large Sites in Main Settlements;
- Policy EMP7 (Employment): Extensions/ Expansions Within the Main Settlement;
- Policy RT1 (Recreation and Transport): General Policy;
- Policy RT8: Open Space;
- Policies RT18 and RI 19: Footpaths and Bridleways;
- Policy I1 (Transport): Development Proposals; and
- Policy T7: Parking Provision

Under the Planning and Compulsory Purchase Act 2004, RVBC is required to prepare a portfolio of new Local Development Documents (LDDs) which together will form the Local Development Framework (LDF). This will ultimately replace the extant Local Plan. Whilst not all of the LDF documents may have been adopted when a planning application is submitted, it is recognised that a number of relevant draft documents will be available. In this context, cognisance will be taken of the following as well as their supporting technical evidence base:

- *Affordable Housing – Memorandum of Understanding*; 2008;



- RVBC Local Development Framework: *Settlement Hierarchy*; December 2008;
- RVBC Local Development Framework: *Core Strategy – Draft for Consultation*; August 2010;
- RVBC Local Development Framework: *Statement of Community Involvement*; December 2010;
- RVBC Local Development Framework: *Core Strategy – Generation of Alternative Development Strategy Options*; June 2011;
- *Addressing Housing Needs in Ribble Valley* (draft); June 2011; and
- *Development Management Policies and Key Statements – Consultation Report*; June 2011.

This Scoping Report now considers the technical content of the EIA.

5. Proposed Scope of the Technical Assessments

5.1 Introduction

The aim of this section is to clearly set out the proposed scope of the technical assessments in the ES and the likely environmental effects that have the potential to be significant as a result of the proposed development. The Trustees of the Standen Estate encourage consultees to provide comment on the scope, whether those comments are in agreement or are recommending additional items to be covered.

5.2 Land Quality

5.2.1 Baseline Conditions

As discussed in Section 2.1, current land use on the site consists of agricultural land. The prevailing planning policy relating to development on agricultural land at a national level is provided by PPS 7 'Sustainable Development in Rural Areas' (2004). Paragraph 27 provides specific guidance setting out the Government's recognition of the importance and varied roles of agriculture to the maintenance and management of the countryside and valued landscapes.

Paragraph 28 of PPS7 makes reference to the Agricultural Land Classification system and specifically advises that the presence of the best and most versatile (BMV) land (Grades 1-3a) should be taken into account when determining planning applications. It further adds that, if undeveloped agricultural land needs to be developed, any adverse effects on the environment should be minimised. Policy ENV6 of the RVBC Local Plan states that BMV agricultural land will be protected unless it can be shown that the need for development overrides agricultural considerations.

A review of the Provisional Agricultural Land Classification (ALC) mapping¹ shows the site as being Grade 3 land, defined as "good to moderate quality agricultural land. Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2."

An initial review of online historic maps² for the site of the proposed development suggests that the area has remained free of built development since at least 1847, with the site being shown as open fields until the present day. It is therefore considered unlikely that there is any heavy contamination of the soils within the area proposed for development.

¹ Ministry of Agriculture Fisheries and Food *Provisional Agricultural Land Classification*. Available at www.magic.gov.uk

² www.old-maps.co.uk

5.2.2 Assessment Scope

The assessment of effects on Land Quality within the ES will comprise the following:

- A desk based assessment using ALC maps and data, soils maps and data and any detailed ALC surveys have been undertaken for the area;
- An assessment of the development taking place, particularly the amounts of land at the different grades being lost permanently or temporarily, their locations and extent and the loss of valuable top soils;
- An assessment as to whether potential effects on BMV agricultural land are significant

Given that evidence available from online sources suggests there has been no built development at the site since at least 1847, it is considered unlikely that the land has been used for any purposes other than agricultural practices, and it is therefore proposed to scope out an assessment of contaminated land from the EIA.

5.3 The Water Environment

5.3.1 Baseline Conditions

The site encompasses a number of drainage ditches which discharge into the Pendleton Brook along the southern boundary of the site, which in turn discharges into the River Ribble ~ 1.8 km to the west.

According to the Environment Agency Flood Zone maps³ the site is not within an area at risk from fluvial or tidal/coastal flooding. The website also notes that the bedrock underlying the site is classified as a Secondary 'A' aquifer⁴. There are no Groundwater Source Protection Zones within or adjacent the proposed site boundary.

5.3.2 Assessment Scope

This assessment of effects on the hydrology of the site and the surrounding area will be based on data collated from a desktop data review, including RVBC's Strategic Flood Risk Assessment, and a visit to the site.

The assessment method will be a qualitative risk assessment based on the probability of an impact occurring and the predicted magnitude of the impact. This approach provides a mechanism for identifying areas where mitigation measures are required and to identify the most appropriate measures to alleviate the risk presented by the development.

The development has the potential to affect water quality through the spillage or release of chemicals such as fuels or oils in the construction phase or through the release of sediment entrained run-off into the local surface water network in the construction phase. To ensure the protection of the water environment the development would incorporate measures based on

³ www.environment-agency.gov.uk

⁴ Defined as "...permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers"



appropriate legislation and guidance (e.g. Environment Agency Pollution Prevention Guidelines and CIRIA best practise documentation). This would include the incorporation of measures such as pollution incidence response planning, and the maintenance and refuelling of machinery on areas of hardstanding during the construction phase. The development of mitigation measures will also include an assessment of the risk of contaminants permeating into any perched groundwaters or the Secondary Aquifer beneath the site. When assessing the drainage requirements for the site, care will be taken to ensure that any existing contaminants in this area will not be mobilised by, for example, the use of infiltration based drainage which could affect the aquifer.

Although the EA flood maps indicate the site is not at risk of fluvial or coastal flooding, given that the site is greater than 1 ha in size a mandatory Flood Risk Assessment (FRA), which will incorporate a Drainage Impact Assessment, will be undertaken as per the requirements of Planning Policy Statement 25 *Development and Flood Risk*. This assessment is likely to focus primarily on drainage impacts and would assess the potential for development on the site to increase flood risk within the development area, or in adjacent areas, and the scope of any mitigation measures needed to remove this risk. This could include the incorporation of attenuation areas to allow for the controlled release of water in storm events or the use of Sustainable Drainage Systems (SuDS) techniques to slow run-off or encourage infiltration. The incorporation of SuDS as part of the scheme would also help to remove any sediments from site run-off.

The incorporation of standard mitigation measures should be sufficient to ensure that there is no significant effect on water quality, however, the effects associated with the construction and operation of the development on the quantity of site run-off and water quality will be assessed. This detailed assessment will involve collection of baseline information on licensed abstractions and discharges; groundwater levels and gradients (if appropriate); surface water flows; water supply; and drainage and foul water services.

As part of the assessment, the relevant bodies including the Environment Agency would be consulted as appropriate. United Utilities will also be consulted with regards to capacity in the local sewer network, and to gather any information on incidences of sewer flooding. This would inform the baseline and would enable the key water receptors to be confirmed.

A conceptual drainage strategy would also be developed as part of the FRA.

5.4 Air Quality

5.4.1 Baseline Conditions

A provisional review of baseline air quality has shown that the proposed development site is not located within an Air Quality Management Area (AQMA), although air quality monitoring along a section of Whalley Road in Clitheroe has shown regular exceedences of the annual mean NO₂ air quality objective in the past three years.

The background mapped concentrations for the 1 km² covering the site are given in Table 5.1. Where data are unavailable for the year considered, the concentrations have been predicted from the nearest year based on the methodology set out in Local Air Quality Management technical guidance (DEFRA, 2009).

Table 5.1 Estimated Mapped Background Concentrations

Year	PM ₁₀ Annual Mean ($\mu\text{g m}^{-3}$)	NO ₂ Annual Mean ($\mu\text{g m}^{-3}$)
2009	11.0	9.7
2010	10.7	9.0
2011	10.6	8.7

Source: <http://laqm.defra.gov.uk/>
The DEFRA website has made available estimates of background pollution concentrations on a 1km² grid for the UK for seven of the main pollutants, with a 2001 base year. For NO₂ and PM₁₀ an updated version is available with a 2008 base year.

5.4.2 Assessment Scope

A quantitative assessment of the air quality effects resulting from the proposed development will be undertaken (both during the construction and operational phases). This assessment will address the extent to which the proposed development complies (or otherwise) with the requirements of the relevant air quality guidance and legislation. The air quality assessment will be informed by a review of the National Air Quality Archive (now on the DEFRA website) and published air quality data and reports for the RVBC area.

Particulate (PM₁₀) and oxides of nitrogen (NO_x) emissions will be assessed on the basis of accepted methodologies (Highways Agency *Design Manual for Roads and Bridges* (DMRB)) during the operational phase, and the assessment will consider the risk of a significant increase in NO₂, PM₁₀ and PM_{2.5} concentrations against the Air Quality Objectives (AQOs). PM₁₀ levels in relation to any earthworks operations during the construction phase of the proposed operations will, however, be addressed as part of a separate dust assessment (see below).

An assessment of the potential impacts of road traffic emissions will be undertaken through the application of the *Design Manual for Roads and Bridges* (DMRB). The model will predict air quality impacts of NO₂ and PM₁₀ from motor vehicles on the surrounding road network as a result of the development, at specific receptors such as façades of residential properties in the study area. This is likely to be the existing residential receptors within 200 m of Pendle Road and Littlemoor on the southern outskirts of Clitheroe and would also include a consideration of whether traffic from the development will have an effect on the potential AQMA on Whalley Road. Some of the new residential properties which form part of the development may be located within 200 m of these roads. The effect of traffic emissions on air quality at these new receptors may need to be considered in the context of introducing new receptors to potentially poor air quality. There are no designated ecological sites within 200 m of the roads in the study area; therefore, the effect of the emissions from traffic associated with the development at designated ecological receptors, are not considered in the assessment. To enable local verification of the DMRB modelling, a statistical comparison will be made between modelled concentrations and local continuous monitoring data and diffusion tubes sited in suitable locations, where these data are available.

Dust arising from construction activities has the potential to cause nuisance by deposition on surfaces such as cars, windows or laundry. This can be short-term (over period of hours or days) or long term accumulation (over a period of months). The extent to which dust nuisance will occur is difficult to assess quantitatively because this depends on the locations of sensitive



receptors and the work being undertaken. When considering the effects of dust nuisance it is usual to identify receptors within 100 m of the site boundary. At present there are a very small number of properties within 100 m of the site boundary. However the phasing of the construction of the site could result in earlier phases of the construction which are built and occupied being affected by nuisance dust from later phases of construction. A qualitative risk-based assessment of the dust effects resulting from construction operations at the site will be carried out, together with identification of best practice dust minimisation techniques.

The National Air Quality Archive and RVBC Air Quality Review and Assessment reports will provide some useful information on existing background air quality in the area, although dust would not be covered in any detail. The reported levels of fine particulate matter (PM₁₀) can be used to infer an ambient level of dust. It is therefore not considered necessary to undertake background dust monitoring around the site, since such data is not considered to be particularly informative to this assessment.

There is no prescribed way to assess the significance of a change in air quality resulting from a new development. Environmental Protection UK (EPUK) has published technical guidance (*Development Control Planning for Air Quality (2010 Update)*) on dealing with air quality concerns within the development control process, which suggests how this can be addressed. This guidance classifies the magnitude of change using a number of descriptors (large, medium, small, and imperceptible). These descriptors are then applied to determine the relevant significance of the change in air quality.

Consideration will also be given to potential odour effects on new residents arising from the Wastewater Treatment Works and landfill site upwind of the proposed development site to the southwest off Henthorn Road.

5.5 Noise

5.5.1 Baseline Conditions

The site is located adjacent to a number of existing noise sources. The current noise climate in the vicinity of the site is likely to be dominated by transportation related noise sources including primarily the A59 but also the A671 Whalley Road. The Blackburn to Settle railway line is also located within ~ 750 m to the west of the site and is likely to be a further periodic source of noise in the surrounding area.

5.5.2 Assessment Scope

In order to assess the potential noise effects upon the development, and to determine current, baseline noise levels, it is proposed to undertake noise monitoring at key locations on and surrounding the proposed development site. These may include residential properties, Ribblesdale School on Queens Road, and the Dent Plant Hire Depot, Whalley Road. Measurement of existing noise levels due to road and rail traffic would be undertaken at a minimum of six locations around the boundary of the site, and at positions approximating the nearest proposed dwellings to the boundary. It is proposed that spot measurements are also taken adjacent to industrial/ commercial properties deemed to be significant sources of noise.

Noise levels would be monitored using a series of Rion NL-31 class 1 integrating sound level meters (SLMs), housed in environmental protection apparatus. Noise levels would be logged



continuously, using 5 minute logging periods, and would include, as a minimum, recording of the LAeq, LAmax, LA10 and LA90 parameters. All measurements would be undertaken, where possible, in compliance with the requirements of BS 7445 1:2003 *Description and Measurement of Environmental Noise - Part 1: Basic Quantities and Procedures*, i.e. with microphones in free field conditions, mounted to a minimum height of 1.2 m.

Noise predictions for both the construction and operational phases of the proposed development would also be undertaken in accordance with current Government guidance (British Standard BS5228-1:2009: *Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1: Noise*, ISO9613-1:1993⁵ and ISO 9613-2:1996⁶). Other guidance of relevance to this assessment includes *The Calculation of Road Traffic Noise* (CRIN) and *The Calculation of Railway Noise* (CRN).

The noise assessment will study potential noise effects on future site occupants and existing sensitive receptors in the vicinity of the site during both the construction and operational phases of the development. The site suitability assessments will focus on the development of the site for residential and commercial uses.

Site suitability for residential development will be assessed in accordance with PPG 24 *Planning and Noise* (1994), which defines Noise Exposure Categories (NECs) for sites proposed for residential development. The assessment of internal and external noise levels will be undertaken to check compliance with the World Health Organisation (WHO) guidance: *Guidelines for Community Noise* (1999) for gardens and open spaces, and the British Standard BS 8233:1999. An assessment in accordance with BS4142:1997 will be undertaken if industrial noise was found to be prevalent across the site. Site suitability for commercial use will be assessed in accordance with BREEAM standards and guidance presented within BS8233:1999.

The effect of the development on existing receptors during the construction phase will be assessed in accordance with guidance defined within BS5228:2009. Road traffic noise impacts during both construction and operational phases would be assessed with the use of guidance as set out in Volume 11 of the Highways Agency publication *Design Manual for Roads and Bridges* (2008).

5.6 Ecology

5.6.1 Baseline Conditions

There are six Sites of Special Scientific Interest (SSSIs) within approximately 5 km of the site:

- Light Clough;
- Little Mearley Clough;
- Coplow Quarry;
- Salthill & Bellman Park Quarries;

⁵ ISO9613-1:1993 'Acoustics – attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere.'

⁶ ISO9613-2:1996 'Acoustics – attenuation of sound during propagation outdoors. Part 2: General method of calculation.'



- Clitheroe Knoll Reefs;
- Hodder River Section.

Of the above, only Salthill & Bellman Park Quarries SSSI is within 2 km of the site of the proposed development (~ 1.3 km to the north). There are internationally designated areas - Special Areas of Conservation (SACs) or Special Protection Areas (SPAs) - within 10 km of the proposed development.

The Forest of Bowland Important Bird Area (IBA) is located within ~ 1 km to the southwest of the site. An IBA is an area recognized as being globally important habitat for the conservation of bird populations. The Forest Of Bowland forms a western outlier to the Pennines, with gentle slopes and level ground on ridges. Fast-flowing streams drain an extensive area of upland moorland and blanket mire, and Common bracken *Pteridium aquilinum* may dominate on lower ground. The IBA supports a range of breeding upland birds, and is a breeding stronghold of Hen Harrier *Circus cyaneus*.

The site of proposed development is not located within any statutorily or non-statutorily designated site of nature conservation value. A non-statutory site, Barrow Clough Wood County Biological Heritage Site (CBI), is located ~ 830 m southwest of the site, beyond the A671. Further CBIs within 2 km of the proposed development include:

- The River Ribble;
- Clitheroe Castle Knoll;
- Primrose Lodge;
- Salthill Quarry;
- Bellman Park Quarry;
- Coplow Quarry, Pimlico Road Grasslands.

A Phase 1 Habitat Survey undertaken by ERAP Ltd⁷ has confirmed that the 13 fields within the site of proposed development are colonised by improved grassland (MG7 community of the National Vegetation Classification (NVC)); this community is of no botanical interest. One field adjacent to Pendleton Brook has received a less intensive agricultural improvement and is representative of a semi-improved (MG6 community) grassland (southwestern corner of the site).

The more steeply sloping ground towards the brook supports local patches of grassland characteristic of a calcareous grassland; these grassland patches are of local interest but are on steeply sloping ground close to the brook and will not be affected by the proposed development.

All fields are bounded by hedgerows with mature hedgerow trees. Of 19 hedgerows seven are assessed to be 'important' in accord with the *Hedgerows Regulations 1997*. Hedgerows are classed as a UK BAP Priority Habitat and are therefore a material consideration in connection with the proposed development.

⁷ 01 March, 19 May and 03 June 2011.



5.6.2 Assessment Scope

The ecological assessment component of the EIA will be undertaken in accordance with good practice guidance (IEEM 2006⁸ and IEA 1995⁹) and will be informed by the following:

- A desk study to collate/ review details of protected and notable habitats and species and designated sites that are known to occur, or have previously been recorded, within the site and surrounding areas;
- An extended Phase 1 Habitat survey of the site, based on the standard survey methodology (INCC 2007¹⁰)

The results of the Phase 1 survey will determine the need for further protected species surveys at the site.

At this stage it is anticipated that the assessment would primarily focus on the potential effects summarised below:

- Effects of the proposed development (including from construction and operation) on locally-designated, non-statutory sites situated within 2 km of the site;
- Effects of the proposed development on Salthill & Bellman Park Quarries SSSI;
- Effects of the proposed development on any habitats of notable nature conservation value within the site including any UK Biodiversity Action Plan (BAP) Priority Habitats/Habitats of Principal Importance;
- Effects of the proposed development on any populations of species of notable nature conservation value within the site including protected species and UK BAP Priority Species/Species of Principal Importance;
- Potential cumulative effects from other nearby developments.

The results of the ecological surveys will inform the Masterplan to ensure, where possible, a significant adverse effect is avoided. The assessment will also include a consideration of all alternatives to avoid or reduce adverse effects on features of ecological interest and increase opportunities for ecological enhancement.

Opportunities for ecological enhancement by protection and conservation of existing features, sympathetic Masterplan design, habitat creation and habitat management will be explored and discussed with the aim to ensuring the proposals will deliver biodiversity gain, in accord with the key principles of PPS9

⁸ Institute of Ecology and Environmental Management (2006). *Guidelines for Ecological Impact Assessment in the United Kingdom* (version 7 July 2006) <http://www.ieem.org.uk/ecia/index.html>

⁹ Institute of Environmental Assessment (1995) *Institute of Environmental Assessment: Guidelines for Baseline Ecological Assessment*, E & FN Spon, London.

¹⁰ INCC (2007). *Handbook for Phase 1 Habitat Survey: A Technique for Environmental Audit*, revised reprint 2003, reprinted 2007. ISBN 0 86139 636 7.



5.7 Traffic and Transport

The traffic assessment will be undertaken by Royal Haskoning Ltd and will be provided in the form of a Transport Assessment (TA) to be appended to the ES. Data from the IA will be utilised within the main body of the ES, particularly the air quality and noise sections.

5.7.1 Baseline Conditions

The site is located adjacent to the west of the A59 which provides a link towards Skipton, Harrogate and the A1(M) to the northeast, and Preston and the M6 to the southwest. The A671 which runs north-south to the west of the proposed development provides access to Burnley, Accrington and the M65 to the south. Direct access from the proposed development to Clitheroe town centre will be provided by Pendle Road and Whalley Road (A671) to the east and west respectively; the latter incorporates the Lancashire Cycleway. The proposed development area is within 2 km of Clitheroe train station.

5.7.2 Transport Assessment

The Department for Transport (DfT) *Guidance on Transport Assessment (GTA)* document provides the necessary scope and guidance on when a TA is required in support of a proposed development in England. In the case of a residential development, the GTA document states that a TA is required for a development of more than 80 units. Given the size of the proposed development it has been assumed that a TA is required to support the planning application for this site.

The TA produced for the site will be in accordance with the procedures set out in the GTA document and discussions will be held with the Highways Authority with regard to key aspects of the methodology and the precise scope of the TA.

5.8 Cultural Heritage

5.8.1 Baseline Conditions

There are no designated heritage assets within the site or within 500 m of the site boundary. The nearest scheduled monument is a standing cross at Clitheroe Castle (SM 27747), which is also a Grade II Listed Registered Park and Garden.

There are 114 listed buildings within the parish of Clitheroe, 111 of which are Grade II listed, one Grade II* listed and one, Clitheroe Castle, Grade I listed. The nearest listed buildings to the proposed development are the Grade II* listed Standen Hall and Grade II listed Old Bothy immediately to the south of the site, the latter situated at Higher Standen; and a terrace of small 18th or early 19th Century houses plus Little Moor House on Littlemoor immediately north of the site, all of which are Grade II Listed and form a group of features¹¹.

It is also noted that the course of a Roman Road runs northeast-southeast through the western section of the site of the proposed development.

¹¹ <http://www.britishlistedbuildings.co.uk/england/lancashire/clitheroe/>

5.8.2 Assessment Scope

It is proposed to undertake a data search to provide more detailed baseline information on the historic environment – both built heritage and buried archaeology – within the vicinity of the proposed development. Data from the Lancashire Historic Environment Record and records of designated features will be collated. It is also proposed to consult with the archaeology planning advisor for RVBC. The assessment will be completed in light of the policy requirements set out in Planning Policy Statement 5: *Planning for the Historic Environment*, which was published in March 2010 and will take the form of a desk-based assessment supplemented by a site walkover. It will include an assessment of effects on the Roman Road and settings of the listed buildings, and Clitheroe Castle scheduled monument and Registered Park & Gardens

5.9 Landscape and Visual Assessment

5.9.1 Context

The Landscape and Visual Assessment (LVA) essentially consists of two related assessments which look at the effects on the landscape as a whole, as well as those of potential visual receptors located in the vicinity of the site. The LVA will be conducted in accordance with the 'Guidelines on Landscape and Visual Impact Assessment, Second Edition' (GLVIA) produced by the Landscape Institute and the Institute of Environmental Management and Assessment 2002, and best practice and professional experience

The assessment will be prepared with reference to the following publications and guidelines:

- Ordnance Survey Maps;
- Ribble Valley Borough Council Development Plan;
- www.magic.gov.uk;
- Aerial photographs.

The study area for the project will be based on a maximum 5 km radius circle, which would be centred within the application boundary.

5.9.2 Landscape

The proposed development site is situated immediately adjacent the southern urban fringe of Clitheroe which is defined by residential development and recreational land use. The site itself is farmed grassland and contains landscape features such as mature hedgerows and individual hedgerow trees. Mature trees line the course of Pendleton Brook on the southern site boundary, and a wood of mature trees surrounds Standen Hall on this boundary. The topography is generally flat, rising gradually from ~ 80 mAOD in the west to ~ 110 mAOD in the east.

The Ribble Valley, within which the proposed development is located, is flanked on both sides by the Forest of Bowland Area of Outstanding Natural Beauty (AONB). Whilst at distance, potential effects upon the AONB will be considered in the assessment.

A review of the proposals map on the RVBC website indicates that there are no local landscape designations that could potentially have their settings affected by the proposed development.



The magnitude and significance of landscape effects generated by any change to sensitive landscape elements will be considered in the assessment of effects on landscape elements. Mitigation measures to enhance the environment will be developed within the layout of the scheme and this may include some additional tree planting.

The landscape assessment will also consider the potential direct and indirect effects of the proposed development on existing landscape character and patterns within the defined study area.

5.9.3 Visual

The assessment of visual effects would quantify the effect of the construction and operation (or occupation) of the proposed development on the views potentially available to key receptors within the study area. The assessment will consist of a desk study and fieldwork to identify potential visual receptors. Visual receptors include: users of recreational landscapes/ public footpaths, bridleways and cycleways; residents; visitors; users of public sports grounds and amenity open spaces; users of public roads and railways; and people employed in Clitheroe.

Receptors identified at this stage include Clitheroe Castle and the Forest of Bowland AONB, including the popular tourist spot of Pendle Hill (located ~ 3.5 km to the east of the site, Lancashire Cycleway, the PRoW network in the local area including those which cross the site, and receptors on the southern urban fringe of Clitheroe including users of the amenity spaces such as the Clitheroe Rugby Football Club, Ribblesdale Wanderers Cricket & Bowling Club, Ribblesdale School Playing Fields, as well as the Clitheroe Royal Grammar School playing fields to the north of Pendle Road, and residents in the Primrose ward and those around Peel Park Avenue and Pendle Road. All visual receptors will be agreed with the local authority.

5.10 Community and Socio-Economic Effects

This section will be primarily concerned about the effect on residents and employees of the locality including:

- Change in local population and respective demand for social and community services;
- Change in the local employment structure and effect on the local employment market;
- Employment opportunities and displacement;
- Increased local expenditure;
- Increase in the numbers and types of housing available;
- New and improved facilities (local footpath links for example);
- Effects on the 'quality of life' enjoyed by the local population.

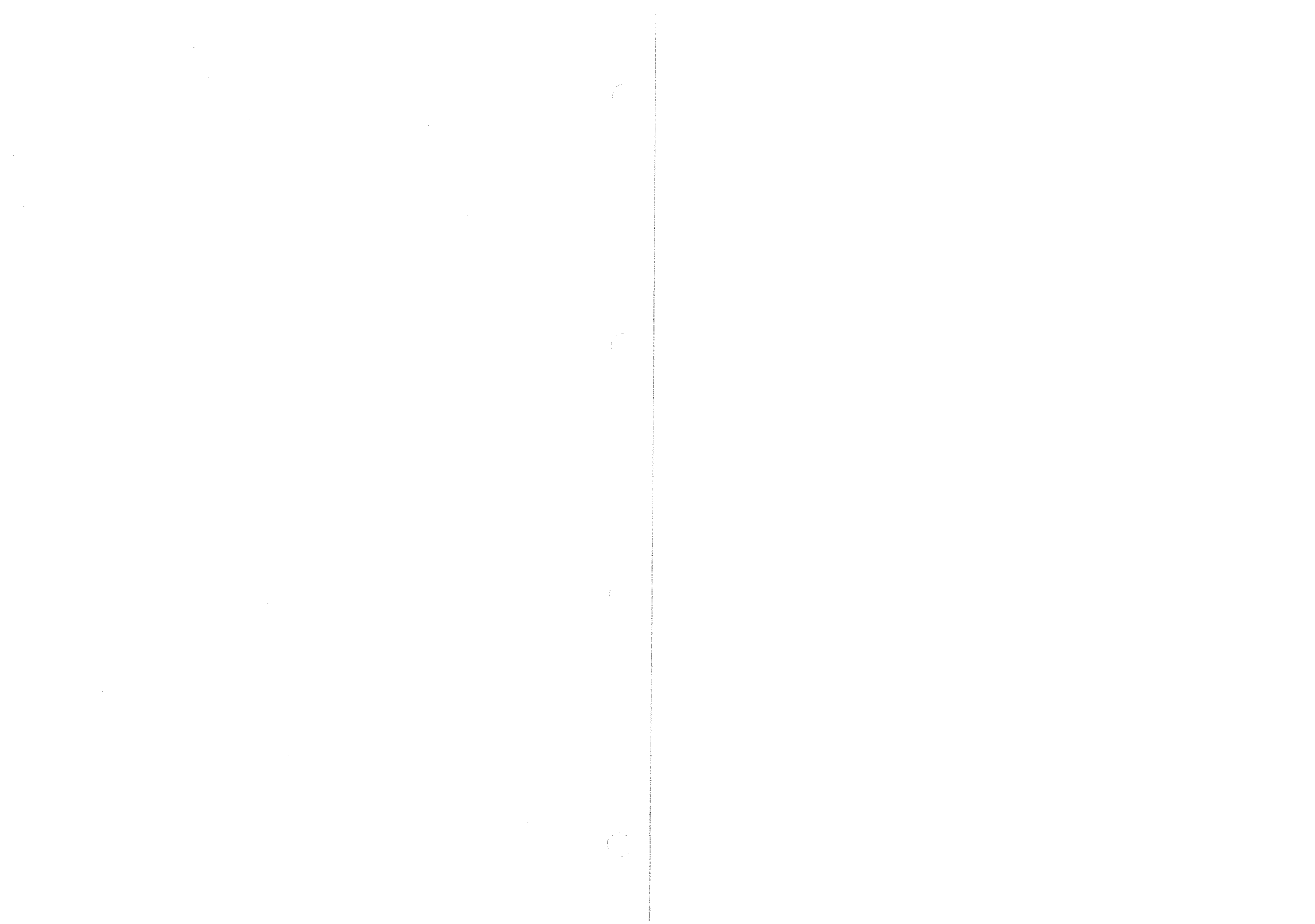
The receptors to be assessed are assessed as being existing residents, future residents and local employers and employees. The sources of information will include the relevant policies and standards of adopted planning policies in the District-wide Local Plan and other stakeholders (Lancashire CC) where these have implications for the scoping of the EIA. The evidence base



to the emerging Core Strategy will also be utilised together with statistics provided by the NOMIS and ONS websites.

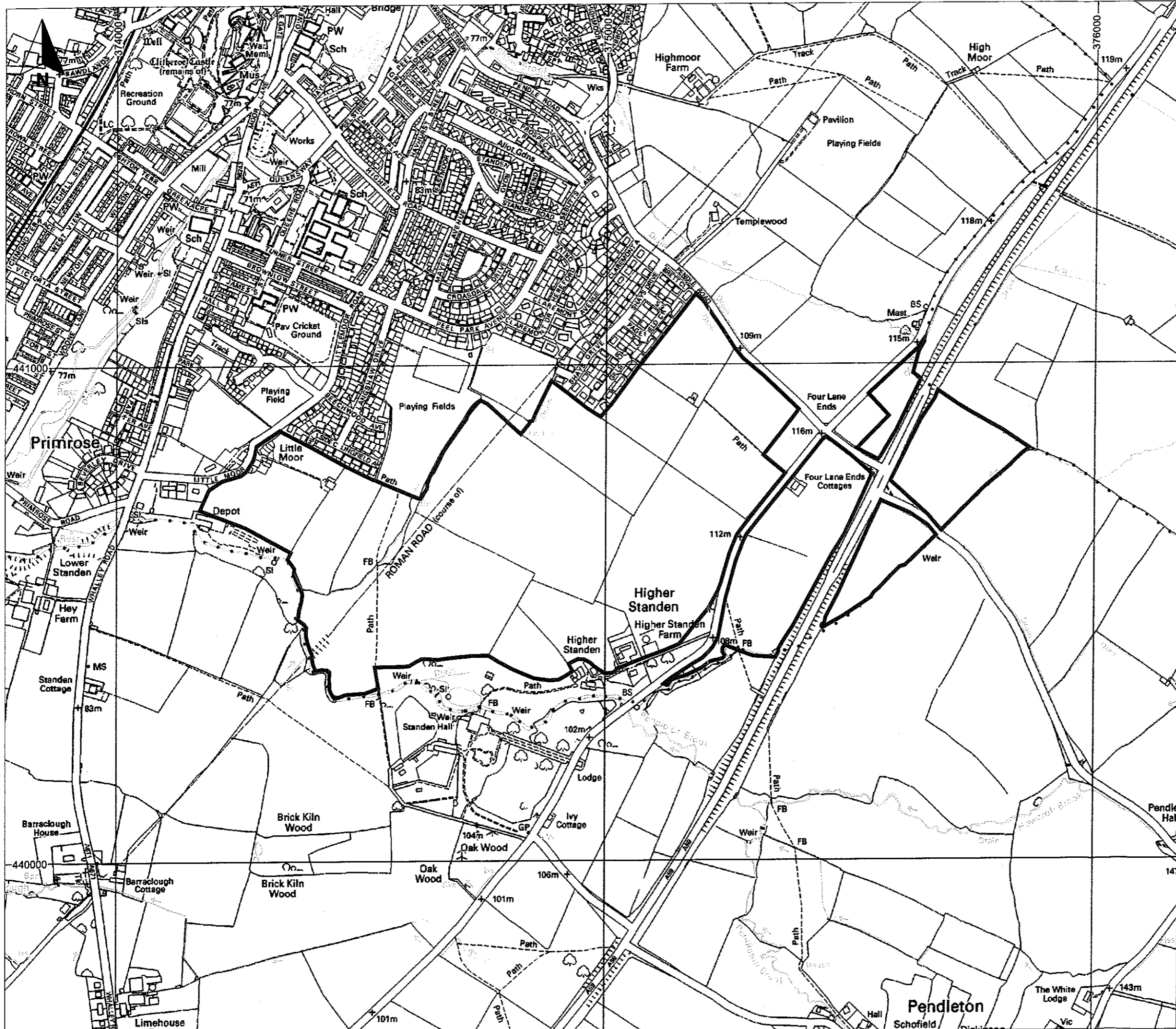
6. Conclusions


The Trustees of the Standen Estate would welcome confirmation on the proposed scope of the EIA so that any suggestions on potential mitigation and enhancement that can be incorporated into the proposed development as we proceed through the EIA process






Figure



Key
 Proposed site boundary

0 m  400 m
 Scale 1:7500 @ A3

Trustees of Standen Estates
 Land at Clitheroe
 Scoping Report

Figure 1
 Site Location

October 2011
 29421-S01 dwg parkj

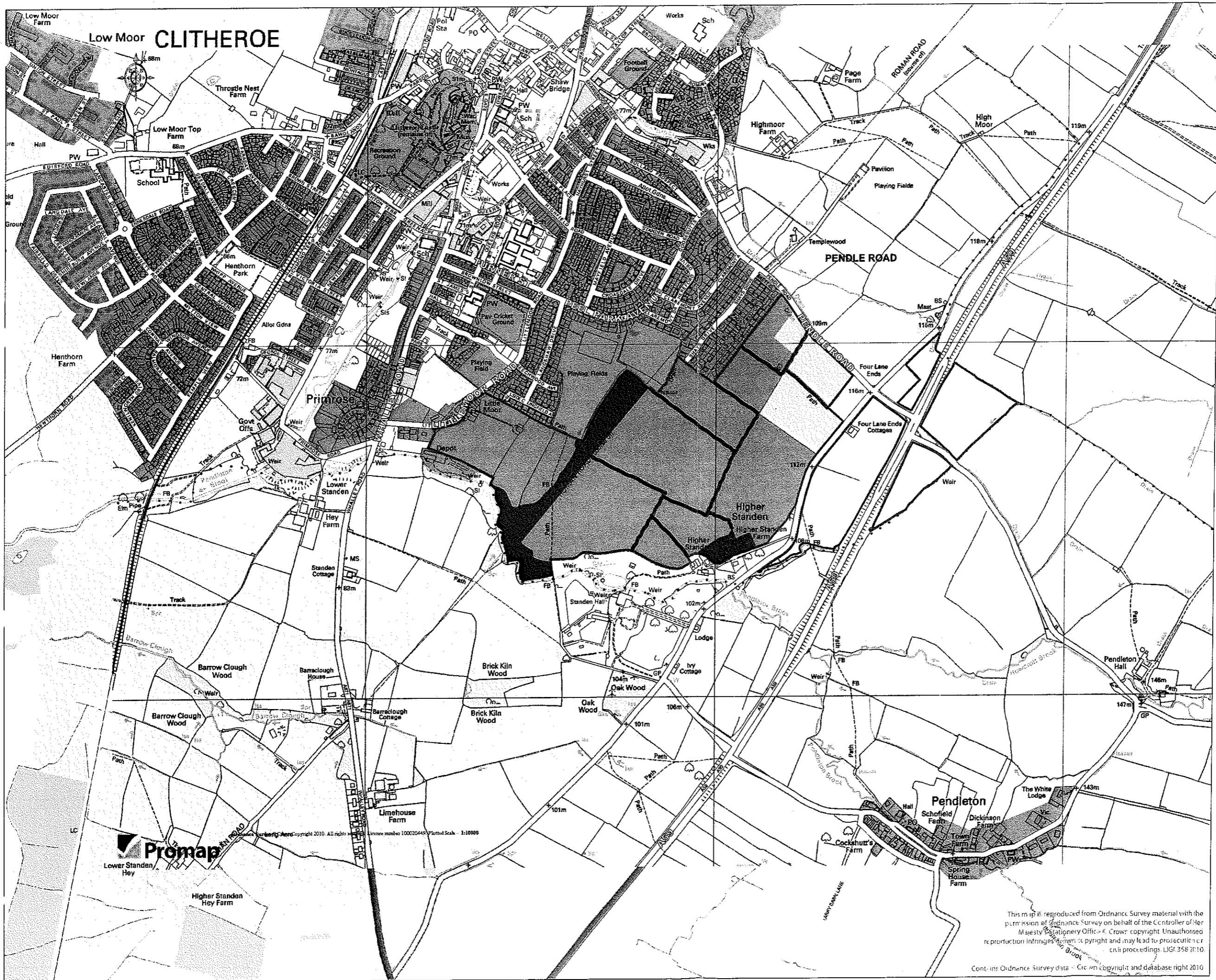


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Appendix A Land South of Clitheroe: Preliminary Masterplan

1 Page



-  Development Site
-  Business
-  Residential / Homes & Community
-  Formal Recreation
-  Informal Open Space, Farmland
-  Education
-  Green Routes & Ecological Features

TRUSTEES OF THE STANDEN ESTATE' CLITHEROE MASTERPLANNING

Proposed Landuse

Scale: NTS
Reviewed by: NL

job drawing rev
5381 0.012 D

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Higher Standen Hey Farm

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Appendix 6.1 Flood Risk Assessment

229 Pages

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3

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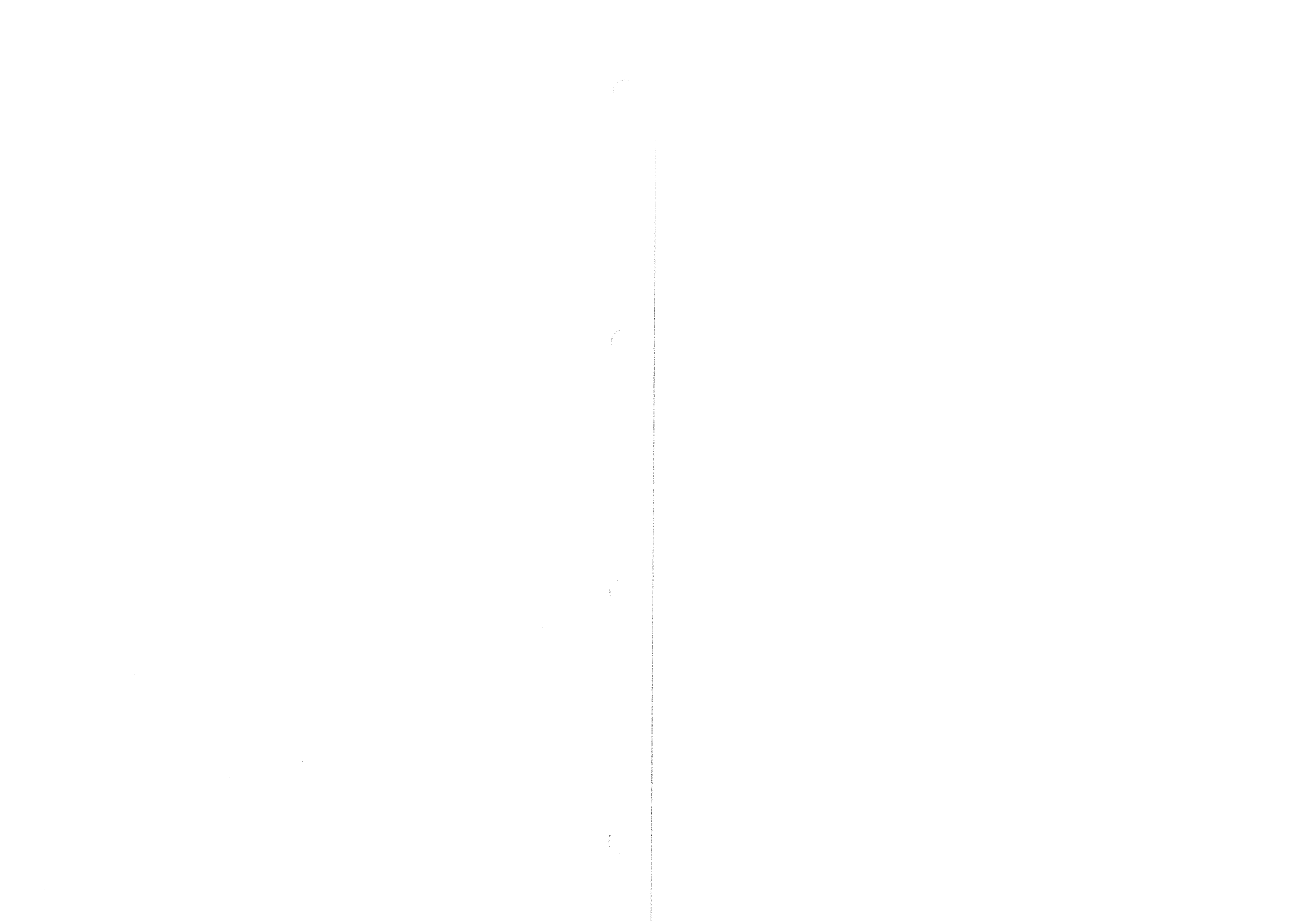
Trustees of Standen Estates

Land South of Clitheroe

Flood Risk Assessment

October 2012

AMEC Environment & Infrastructure UK Limited





Report for

Trustees of the Standen Estate
c/o Richard Percy
Steven Abbott Associates
Broadsword House
North Quarry Business Park
Appley Bridge
Wigan
Lancashire WN6 9DB

**Trustees of Standen
Estates****Land South of
Clitheroe**


Flood Risk Assessment

October 2012

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flood risk\fra\docs\vr03315 doc

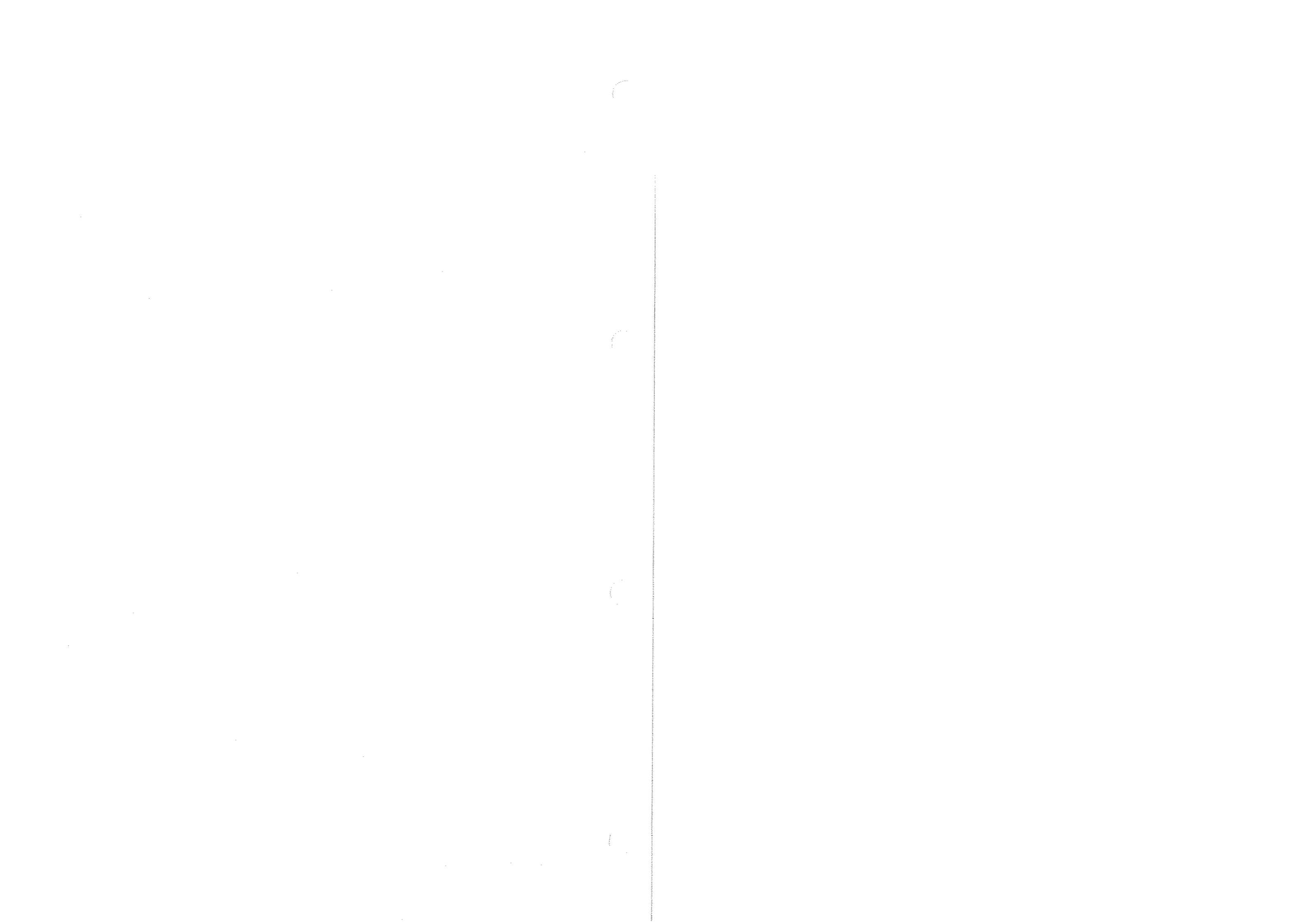


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Executive Summary

AMEC Environment & Infrastructure UK Ltd (AMEC) was commissioned in 2011 by Trustees of Standen Estates to undertake a Flood Risk Assessment (FRA) to support a proposed strategic site allocation in the Ribble Valley Borough Council Core strategy for a predominantly residential development of land south of Clitheroe, Lancashire (see Figure 2.1).

Two sites are assessed – the main development site (50.1 ha), and four areas of land forming the junction improvement areas (14.3 ha). The majority of these areas are currently greenfield except for some small areas containing agricultural buildings. A small strip of land along the southern edge of the main development site is located in a small valley approximately 10 m lower in level than the majority of the site. The valley bottom is located within Flood Zones 2 and 3 and is associated with the floodplain of the Pendleton Brook (see Figure 3.1). However, the area of the main development site where all development will be situated lies entirely within Flood Zone 1. The junction improvement areas also lie entirely in Flood Zone 1. In accordance with the National Planning Policy Framework a FRA is required because the site is over 1 ha in area and because part of the site (as opposed to the development area) lies in Flood Zones 2 and 3.

All potential risks of flooding to the site have been assessed and relevant flood management and mitigation measures have been recommended where necessary. Overall there is limited flood risk to the site, the most significant source being the areas of groundwater emergence along the onsite watercourse. However, as these locations are within the watercourse corridor, away from the main development area, their risk to the development is small. In any event, for other reasons the current masterplan indicates that this area will be left as a green corridor.

A surface water management strategy has been developed which recommends various SuDS techniques to control discharge rates from the site to a greenfield runoff rate of 10 l/s/ha as agreed with the Environment Agency. Preliminary estimates (Section 4) indicate that approximately 26,600 m³ of storage is required to meet this criterion for the development site (assuming 65% of the developed site is impermeable). This estimate will need to be refined as site plans are developed and during detailed design. Attenuation will be provided via geocellular subsurface storage, which will drain to a series of swales and attenuation basins within landscaped areas of the site.

No runoff attenuation assessment for the area containing a road junction improvement scheme (at the junction of the A59 and Pendle Road) has been undertaken, since no details of any proposed changes in the areas of impermeable surface (i.e. road surface) are currently available. It is considered unlikely that the impermeable area of the improved junction will differ significantly from the impermeable area at the existing road junction. If there is a minor increase in surface area, this should be evaluated once the design is confirmed, and appropriate provision for SuDS included in the final design.

Infiltration tests are recommended to determine whether or not infiltration based SuDS can be implemented. Given the background geology, it is considered unlikely that infiltration can form the main form of surface water management. However, tests may show that infiltration is sufficient to aid some Source Control measures such as permeable paving and filter strips. For this reason some infiltration may be possible on the main development site, but not at the junction improvement site.



Ground profiling and minimum finished floor levels are also recommended to ensure control of overland flow in excess of the capacity of the drainage system and to prevent ponding. It is recommended that corridors are left along the watercourses to enable future maintenance access.

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1. Introduction

1.1 Context

AMEC Environment & Infrastructure UK Ltd (AMEC) was commissioned in November 2011 by Trustees of Standen Estates to undertake a Flood Risk Assessment (FRA) to support a proposed strategic site allocation in the Ribble Valley Borough Council Core strategy for a predominantly residential development of land south of Clitheroe, Lancashire (referred to as the site). The site is currently greenfield and is over 51.4 hectares in area (49.3 ha for the main development site, 2.1 ha land for improved A59 road junction). The Environment Agency Flood Risk map currently classifies the majority of the site as Flood Zone 1, defined as having a less than 0.1% annual exceedance probability (AEP) of fluvial or tidal flooding. A small strip of land along the southern edge of the main development site is located in a small valley approximately 10 m lower in level than the majority of the site. The valley bottom lies within Flood Zone 2 and 3 and is associated with the floodplain of Pendleton Brook (see Figure 3.1). The area of the site that will be developed is entirely in Flood Zone 1. The junction improvement areas are entirely in Flood Zone 1.

This FRA has been prepared in accordance with the National Planning Policy Framework (NPPF) which replaces Planning Policy Statement 25 (Development and Flood Risk) (PPS25) while retaining the key elements of that policy statement. The NPPF states (paragraph 103) that a site-specific FRA is required for development proposals of 1 hectare or greater in Flood Zone 1, all proposals for new development located in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding.

The main purpose of the FRA, as detailed in the NPPF, is to demonstrate how flood risk to the proposed development and any increased flood risk to third parties due to the development, will be managed over the lifetime of the development, taking climate change into account.

1.2 Structure of this Report

The report is structured as follows:

- Section 2: Site Description: development proposals and planning context;
- Section 3: Flood Risk Appraisal: this provides an initial assessment and a summary of the various sources of flood risk to the site;
- Section 4: Surface Water Management Strategy: this section details the surface water drainage strategy and provides details of any mitigation required to limit surface water runoff;
- Section 5: Flood Risk Management and Mitigation: this section details the measures to be taken to manage and mitigate flood risk;

- Section 6: Summary, Conclusions and Recommendations: this Section summarises the report findings and presents the conclusions and recommendations.

The figures are embedded within the main text of the report while various supporting documents are presented at the end of the report in the form of appendices. In total there are eight appendices, as follows:

- Appendix A contains the topographic survey;
- Appendix B provides the illustrative site layout plan;
- Appendix C provides evidence of the consultation process (including consultation with the Environment Agency, United Utilities and Lancashire County Council);
- Appendix D contains site photographs;
- Appendix E contains the site services plan;
- Appendix F contains details of the surface water runoff calculations;
- Appendix G contains the EnviroCheck Flood Report for the site; and
- Appendix H details the ReFH calculations undertaken for the on-site watercourse

1.3 Sources of Data

- National Planning Policy Framework (2012);
- Technical Guidance to the National Planning Policy Framework (2012);
- PPS 25 Development and Flood Risk Practice Guide (2009);
- British Geological Survey (BGS) DiGMapGB-625 data 1:625 000;
- Environment Agency website www.environment-agency.gov.uk; 'What's in your backyard' (2012);
- Defra/Environment Agency. FD2320. Flood Risk Assessment Guidance for New Development Phase 2. R&D Technical Report FD2320/TR2. 2005' and 'Environment Agency. Supplementary note on flood hazard ratings and thresholds for development planning and control purpose – clarification of the Table 13.1 of FD2320/TR2 and of FD2321/TR1. (2008);
- CIRIA, C697, The SUDS Manual, (2007);
- Ribble Valley Borough Council. Draft Core Strategy for Consultation (2012);
- Ribble Valley Borough Council Strategic Flood Risk Assessment – Level 1, (2010);
- Landmark Information Group. Envirocheck Report Flood Screening Report Datasheet, (2012).

2. Site Description, Development Proposal and Planning Context

2.1 Site Description

2.1.1 The Site

The main site is centred at Grid Reference SD 74846 40704 just west of the A59 at Clitheroe, Lancashire. The site is surrounded by existing residential properties at the northwest edge, with some recreational playing fields. Standen Hall and grounds are situated to the southeast. The site is bounded to the north by Pendle Road and to the north of this road by open fields. To the south the site is bounded by a narrow, deep valley containing Pendleton Brook. Apart from the farm complex for Higher Standen Farm the site is entirely greenfield and consists of grazed grassland. Figure 2.1 shows the site location and situation

The access to the site is centred at Grid Reference SD 75575 40765 around the A59/Pendle Road junction. The land beside the roads here currently consists of open fields (grazed grassland)

The site and the access routes to it are not located in a fluvial or tidal flood risk area and therefore safe access and egress can be maintained at all times as the adjacent areas of Clitheroe and the A59 are within Flood Zone 1.

2.1.2 Topography

A topographic survey carried out in August 2011 (see Appendix A) shows that elevations on the main site range from 114.1 m AOD at the Four Lane Ends junction, to 79.0 m AOD adjacent to the Pendleton Brook in the south and to the west adjacent to Littlemore Lane. In general, the site slopes westwards with the exception of the steep slope and small tributary ravine situated in the south of the site.

Elevations on the access route site range from 115.0 m AOD to 117.5 m AOD.

Clitheroe is located in the Ribble Valley which is an undulating, broad bottomed, fertile valley lying between the moorland hills of Pendle Hill to the east, Waddington Fell and the Bowland Hills to the north-west and Longridge Fell to the southwest. The headwater valleys of the catchment are steep sided with numerous minor tributaries, giving way to shallower-sloped valley sides with wider floodplains in their middle courses, such as on the Ribble around Clitheroe.

2.1.3 Hydrology, Drainage, Hydrogeology and Soils

Hydrology and Drainage

Pendleton Brook is the nearest watercourse to the site, flowing along part of the site's southern boundary, in a westerly direction. At its closest point to the site the banktop ground elevation is approximately 79.0 m AOD. At the downstream end of the site, the watercourse has a

catchment area of 6.3 km². A minor watercourse rises on site and flows south through the middle of the site, to Pendleton Brook. This watercourse falls from around 98 m in its upper reaches within the site, to 78 m AOD where it joins Pendleton Brook. This tributary has a catchment area of around 0.3 km² as measured to the confluence with Pendleton Brook.

In general the watercourses lie within narrow steep-sided valleys which separate them from the main development area. Upstream of the site, Pendleton Brook passes under Standen Lane, the catchment above this point being predominantly rural. Downstream of the site there are some abandoned sluices, which appear to have formerly held back water before allowing it to flow downstream to a mill impoundment reservoir located west of Whalley Road (now infilled and being redeveloped for housing). The sluices are in the open position, and do not appear to be operable. If the sluices were to be closed, water could back up to a depth of between 2 and 3 m, but this would not impact the site as the nearest development areas are situated well above, at levels of between 87 and 99 m AOD. Photographs of the site are provided in Appendix D.

The Flood Estimation Handbook (FEH) CD ROM locates the site within the Pendleton Brook catchment; with a catchment area of 6.3 km² at this point. The FEH CD ROM gives a standard average annual rainfall (SAAR) of 1275 mm for the site.

These two main watercourses and some other minor shallow dry ditches/flow routes are shown on Figure 3.2.

Consultation with United Utilities has indicated that the nearest recorded foul sewers are situated within the residential area to the west of the site (see Appendix E). Provision of a connecting sewer would need to be agreed with United Utilities and constructed to serve the site. Further detail is given in the accompanying Services study document.

Geology, Hydrogeology and Soils

British Geological Survey (BGS) digital geology mapping¹ data shows the bedrock at the site to be of the Bowland High Group and Craven Group, made up of interbedded Mudstone, Siltstone and Sandstone. Specifically, the BGS website indicates that the Clitheroe Limestone Formation and Hodder Mudstone formation are the bedrock formations under the site while the superficial geology is made up of Till and Diamicton.

At the site the bedrock is designated as a Secondary A aquifer. The Environment Agency website defines this as “*A permeable layer capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers*”. The superficial Diamicton/Till is not classified as an aquifer. The LANDIS Soilscape² database indicates that the soils present on the site are: “slowly permeable, seasonally wet acid loamy and clayey soils.”

The FEH CD-ROM gives an SPRHOST value of 42.1 for the site. This indicates a moderate to low soil permeability, and hence high greenfield run-off rates. The Flood Studies Report Winter Rainfall Acceptance Potential (WRAP) Map also indicates that the site is located with a zone of low permeability, on the basis of soil characteristics. This is consistent with the FEH CD-ROM, which gives a BFIHOST value of 0.349 which confirms the low permeability of the catchment. This value indicates that the catchment groundwater sources comprise approximately 35% of the total annual discharge (for the catchment to the site).

¹ See: <http://www.bgs.ac.uk/geoindex/>

² See <http://www.landis.org.uk/soilscape/>

The FEH CD-ROM for the year 2000 gives the percentage urban catchment coverage (URBEXI2000) for the catchment as 0.005%. This indicates that the catchment is predominantly rural, with limited development.

The Environment Agency has stated in recent correspondence (see Appendix C) that the existing greenfield runoff rate adopted for the calculations should be taken as 10 l/s/ha

2.2 Development Proposal

The following elements are proposed for the development:

- Residential dwellings;
- Retirement living, the form to be determined;
- Ancillary retail and community facilities;
- Employment (B1 offices);
- A primary school site;
- Large areas of greenspace along the watercourses and through the site; and
- An improved (roundabout) junction between Pendle Road the A59

Under the NPPF, the vulnerability classification of dwelling houses, educational establishments and residential care homes is 'More Vulnerable' (see Table 2 in NPPF Technical Guidance).

Appendix B shows the proposed layout of the site. At this stage it has been assumed that approximately 65% of the main 49.3 ha development site will be impermeable based on studies on other similar sites. This will be further refined as the masterplan is developed. Table 2.1 summarises the proposed changes to permeable/impermeable land uses across the development site. The table indicates that the impermeable surface cover at the site would increase by 31 ha. As a result peak rates and volumes of storm run-off will increase and require management to achieve the specified greenfield runoff rate of 10 l/s/ha specified by the Environment Agency (see Section 5 for the Drainage Strategy, and EA Correspondence in Appendix C).

No runoff attenuation assessment for the junction improvement area has been undertaken, since no details of any proposed changes in the impermeable area are yet available. It is considered likely that the impermeable area of the improved junction will not differ significantly from the impermeable area of the existing road junction. Any small increase in surface area should be evaluated once the design is confirmed and appropriate provision for SuDS included in the final design.

Table 2.1 Existing/Proposed Impermeable/Permeable Split

Surface Cover Unit	Existing (ha)	Proposed (ha)
MAIN SITE		
Impermeable development (buildings, roads etc)	0.6 ha	31.6 ha
Permeable development (greenfield/garden/planted/grassed etc)	48.7 ha	17.7 ha
Total	49.3 ha	49.3 ha

2.3 Planning Context

2.3.1 Ribble Valley Strategic Flood Risk Assessment and Local Plan

The Core Strategy 2008-2028 'A Local Plan for Ribble Valley' Regulation 19 Consultation Draft was out for consultation between 4 May and 15 June 2012. The draft consultation Core Strategy contains two policies relevant to flood risk and site drainage. These are EN3 (Sustainable Development and Climate Change) which states the need for developments to include allowances for the potential impacts of climate change, and also the need for Sustainable urban Drainage Systems (SuDS). Policy DME6 (Water Management) indicates that development will not be acceptable in areas of unacceptable flood risk, or if they increase flood risk elsewhere. They should take steps to prevent the pollution of surface and ground water, and manage surface water through the use of SuDS. The policy also states, that in parallel with flood management objectives the biodiversity value of the borough's watercourses should be protected.

The Ribble Valley Borough Council Level 1 Strategic Flood Risk Assessment (SFRA) was adopted in 2010. The SFRA describes how over 70% of the District lies in the Forest of Bowland Area of Outstanding Natural Beauty (AONB) and comprises a largely rural district with a number of large and small settlements. Clitheroe is the largest of three main settlements in the District. The SFRA states that development should be concentrated into Key Service Centres. Previous definitions of Key Service Centres in earlier sub regional plans identified Clitheroe, as one of four Ribble Valley Borough Council Key Service Centres that are currently the major focus of development within the existing district wide Local Plan. The SFRA provides some basic guidance on requirements for a FRA, but largely refers to national guidance on flood risk (i.e. PPS25 – now replaced by the NPPF).

The Local Plan encourages new development to include measures for adaptation to climate change and emphasises the need to protect the most versatile agricultural land and the need to make use of Sustainable Drainage (SuDS) techniques.

2.4 Sequential Test and Exception Test

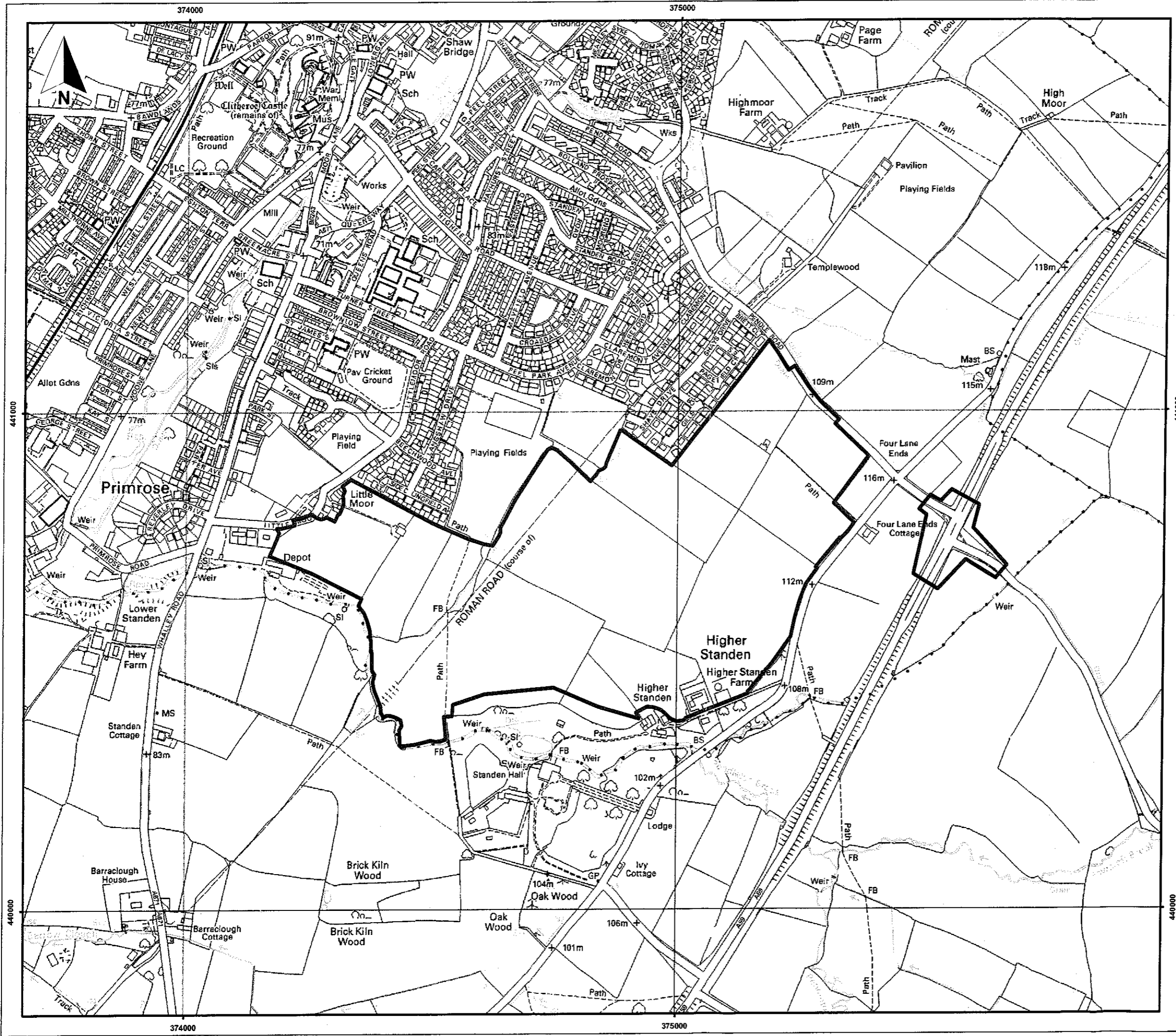
2.4.1 Sequential Test

The NPPF and the accompanying Technical Guidance document describe the principles of the Sequential Test, which aims to steer new development to areas with the lowest probability of flooding. The Sequential Test is a decision-making tool designed to ensure that sites at little or no risk of flooding are developed in preference to areas at higher risk. As the majority of the development site is located within Flood Zone 1 and all of the proposed development will be located here, the Sequential Test is considered to have been passed. All new development with run off implications will be in Flood Zone 1.

2.4.2 Exception Test

Table 3 in the Technical guidance for NPPF identifies that, for a 'more vulnerable' development within Zone 1, the Exception Test does not need to be applied. For this reason the type of development proposed is considered to be appropriate for this site, and therefore the Exception Test has not been considered further in this FRA.



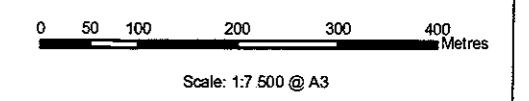


Key:

Site Application Boundary

The main development site is the 50.1 ha plot in the west.

The four smaller areas to the east (14.3 ha total) comprise the total boundary of land, some of which will be used for the A59 junction improvements.



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Trustees of Standen Estate
Land South of Clitheroe
Flood Risk Assessment

Figure 2.1
Site Location Plan

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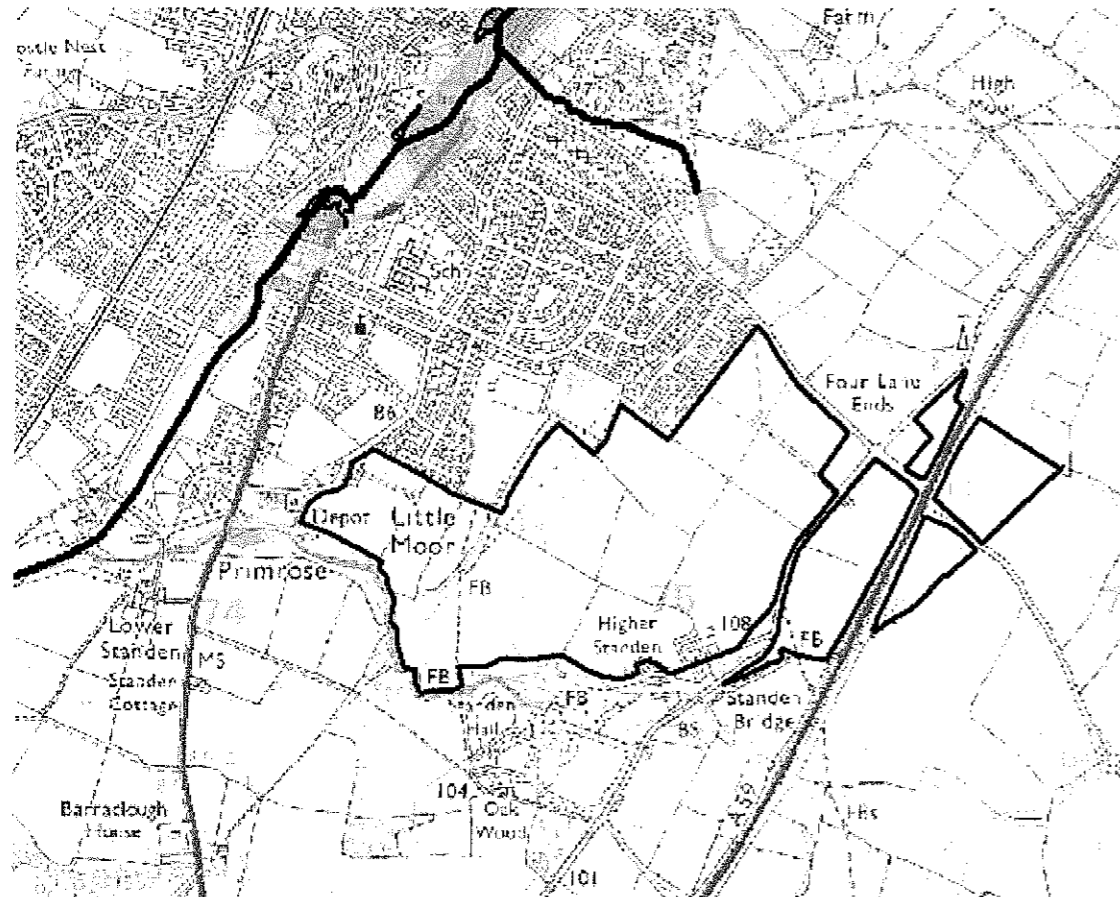


3. Flood Risk Appraisal

3.1 Summary of Potential Sources

The Environment Agency's flood map is shown in Plate 3.1. It can be seen that the site lies almost entirely in Flood Zone 1, with only a narrow strip of Flood Zone 2 and 3 associated with the watercourse along the southern boundary. Table 3.1 summarises the flood risk across the site from various potential sources of flooding; these are then discussed in the following sections.

Figure 3.1 Environment Agency Flood Map



Key: dark blue line = EA Main River, light blue shading = Flood Zone 3, turquoise shading = Flood Zone 2. Red polygons = site boundaries. Black hashed areas = areas protected by flood defences.

Table 3.1 Summary of Potential Flood Risk Sources

Source of Flooding	Risk Posed	Notes
Fluvial	Limited Risk	The site is located in Flood Zone 1, and is therefore not at risk from larger watercourses such as the Pendleton Brook, which is located within a steep side valley 10 to 20 m lower than the main development site. However there is one small watercourse present which rises within the site, and flows southwards to join the Pendleton Brook, which needs to be assessed further.
Tidal	No Risk	There is no risk of tidal flooding to the site
Groundwater	Medium	The BGS groundwater flooding susceptibility maps (taken from the Envirocheck Flood Report) show the site to have a moderate to moderately high susceptibility to groundwater flooding
Surface runoff/run on and surface water drainage	Medium	The Risk Management Solution flood data (taken from the Envirocheck Flood Report) shows only limited flooding of the site along watercourses up to and including the 1 in 100 year return period. The 1 in 1 000 year map shows a pluvial flood risk covering a larger area in the centre of the site, associated with the minor on site watercourse. The proposed area of impermeable surfaces on site will increase as a result of the development. A surface water management strategy is being developed to ensure this is managed and attenuated so as not to increase downstream flood risk.
Sewer	Low	United Utilities has recorded a sewer flooding incident to the west of the site (downslope of the site). There are no other records of sewer flooding near the site. There are also, currently, no foul sewers present on site.
Artificial	No risk	There are no artificial waterbodies, or flood defences that pose a risk of flooding to the site

3.2 Historic Flooding

The Envirocheck Flood Report indicates that the Environment Agency has no available records of flooding on or immediately adjacent to the site. Lancashire County Council and United Utilities were also contacted to request any information on historic flooding in the area. Lancashire County Council stated that they had no record of any notable flooding incidents near the Standen site, however there was the occasional blocked gully that caused localised flooding; no detail was provided on the exact location of this gully. United Utilities checked their available records and found one DG5 sewer flooding issue on Turner Street within the Primrose area of Clitheroe to the north-west of the site. No detail as to the date and severity of the issue or whether the cause had been addressed was available. Turner Street is approximate 300 m north-west of the site and downslope from the adjacent part of the site. Therefore flooding at that location should not directly impact the development site.

The Envirocheck Flood Report presents flood insurance risk data which provides an insight into historical flooding incidents via the record of insurance claims at that postcode. The report shows that there have been no recorded claims in the 'BB7 1' postcode area in the period up to March 2012, suggesting that there have been no major flood incidents.

The RVBC SFRA presents a record of the major historical river flood events in the Ribble catchment; however records have only been recorded for the main River Ribble, and not for

smaller watercourses such as the Pendleton Brook. In addition, review of the SFRA and consultation with the Environment Agency yielded no evidence of pluvial or groundwater flooding in the area.

3.3 Fluvial Flooding

3.3.1 Pendleton Brook

The Environment Agency has provided river modelling flood level data for Pendleton Brook, which is the closest watercourse to the site, running along part of the southern edge of the site. These levels are summarised in Table 3.2. It can be seen that even in the 1 in 1000 year event flood levels are not high enough to inundate the site. The watercourse therefore poses an insignificant risk to the development.

Node locations, and the edge of the Flood Zone 2 (the 1 in 1000 year fluvial event) based on comparing these levels with the site topographic survey are indicated on Figure 3.2. The watercourse is relatively steep and situated in a narrow valley. It is recommended that the edge of Flood Zone 2 is used here as the boundary for development. The SuDS attenuation ponds and all development should be located outside of Flood Zone 2. Flood Zone 3 is not shown; however it is recommended that the extent of Flood Zone 2, as indicated on Figure 3.2 is used to mark the edge of Flood Zone 3 (the 1 in 100 year fluvial event) including for the effects of climate change.

Table 3.2 Environment Agency Flood Levels for the Pendleton Brook

Hydraulic Model Node Reference	Adjacent Development Site Elevations*	Banktop Level*	Environment Agency Flood Levels (see Appendix C)			
			Q5	Q75	Q100	Q1000
PTON01_1270	98.6 m AOD	~90 m AOD (OS map)	90.70 m AOD	91.03 m AOD	91.06 m AOD	91.84 m AOD
PTON01_0850A	89.0 m AOD	79.5 m AOD	80.43 m AOD	80.70 m AOD	80.74 m AOD	81.43 m AOD
PTON01_0420	79.1 m AOD	~72 m AOD (OS map)	71.62 m AOD	71.94 m AOD	71.99 m AOD	73.52 m AOD

*unless otherwise indicated levels are from the site topographic survey

3.3.2 On-site Tributary

A small watercourse rises on site (see Figure 3.2), having a catchment area of around 0.3 km². At the time of the site visit on 21 March 2012, there was limited flow in the channel, apart from at the downstream end. Here there was more substantial flow where numerous springs within the bottom of the narrow ravine were observed to be feeding into the stream. The upper ditch was dry, with a very small flow in the middle section of the watercourse. Part of the system appeared to be piped. Based on these observations, the upper part of the system appears to be fed largely by surface water runoff from the existing fields. Photos of the watercourse can be seen in Appendix D.

A brief ReFH analysis has been carried out to check on potential peak flows (see Appendix H for ReFH audit sheets). This indicates (Table 3.3) that the current peak flows within the watercourse are likely to be minimal. Based on the site visit and the photos in Appendix D, the existing channel would be capable of conveying these flows. Plate D.29 corresponds to the 0.15 km² values in Table 3.3, and Plate and D.37 to the 0.3 km² values. In future, the majority of the surface water catchment of the stream will be intercepted by the proposed development and diverted through sustainable drainage features (SuDS) before being attenuated and released to the Pendleton Brook. These estimated flows will therefore be further reduced following development, although the lower section will continue to receive groundwater flows.

Table 3.3 ReFH Flows for the On-site Watercourse

Location	Q100	Q100 + 20%
Confluence with the Pendleton Brook (0.3km ²)	1.20 m ³ /s	1.44 m ³ /s
Half of catchment (0.15km ²)	0.60 m ³ /s	0.72 m ³ /s

*unless otherwise indicated levels are from the site topographic survey

Given the small catchment and resulting small flood flows, and the future interception of surface water runoff, the watercourse is not considered to pose a flood risk to the development. It is recommended that the lower portion of the watercourse is left within a green corridor to allow access for future maintenance.

3.4 Groundwater Flooding

The Ribble Valley Borough Council (RVBC) Strategic Flood Risk Assessment (SFRA) concluded that, using the best available information, groundwater flooding was not a significant risk (2010). However the Envirocheck Flood Report (Appendix G) presents BGS groundwater flooding susceptibility maps and shows the site to have a 'moderate' to 'moderately high' susceptibility over the large majority of the area. The area is known to be underlain by a variety of rocks (ranging from mudstone to limestone) which have varying permeabilities.

Given the site location on the side of the broader River Ribble valley, 30 m to 60 m above the main valley bottom, it is not expected that groundwater levels would be near to the surface. Springs were only observed in the areas of the site adjacent to watercourses, in particular the ones feeding the small onsite watercourse and others adjacent to the Pendleton Brook. These are likely to be related to the emergence of groundwater from minor perched aquifers within a narrow band of outcropping limestone/high permeability bedrock seams exposed at these topographic low points. As these locations are located within the small ravine that the watercourse passes through, this source of flood risk is unlikely to pose a risk to the development area.

If development proposals were to include for any basements, the danger of groundwater ingress would need to be assessed. In addition the following precautions should be taken against groundwater flooding, and be incorporated within the surface water management strategy:

- Finished Floor Levels should be maintained a minimum of 150mm above surrounding ground; and
- Low points within the site where rising groundwater might pond should be avoided by careful profiling of the ground to allow overland drainage away from the buildings. The course of the watercourse should be kept within a green corridor of open space.

3.5 Surface Water Flooding

The Risk Management Solution flood data (taken from the Envirocheck Flood Report) shows only limited flooding of the site, along watercourses and only covers flood events up to and including the 1 in 100 year return period. The 1 in 1 000 year map shows a pluvial flood risk covering a larger area in the centre of the site, associated with the minor on site watercourse. This indicates that the site is at low risk of pluvial flooding, except during a very extreme flood event. The site is also high above adjacent watercourse valleys, where pluvial (surface water) would be expected to concentrate. In comparison, it can be seen that during the 1 in 1 000 year pluvial flood large portions of the Clitheroe, and the Ribble Valley area are at risk of flooding.

The increase in impermeable surfaces will also increase the surface water flood risk; therefore a surface water management strategy is required and is presented in Section 4. This outlines measures to restrict runoff from the site to greenfield rates (10 l/s/ha as requested by the Environment Agency).

In addition the following precautions should be taken against surface water flooding on site, and be incorporated within the surface water management strategy:

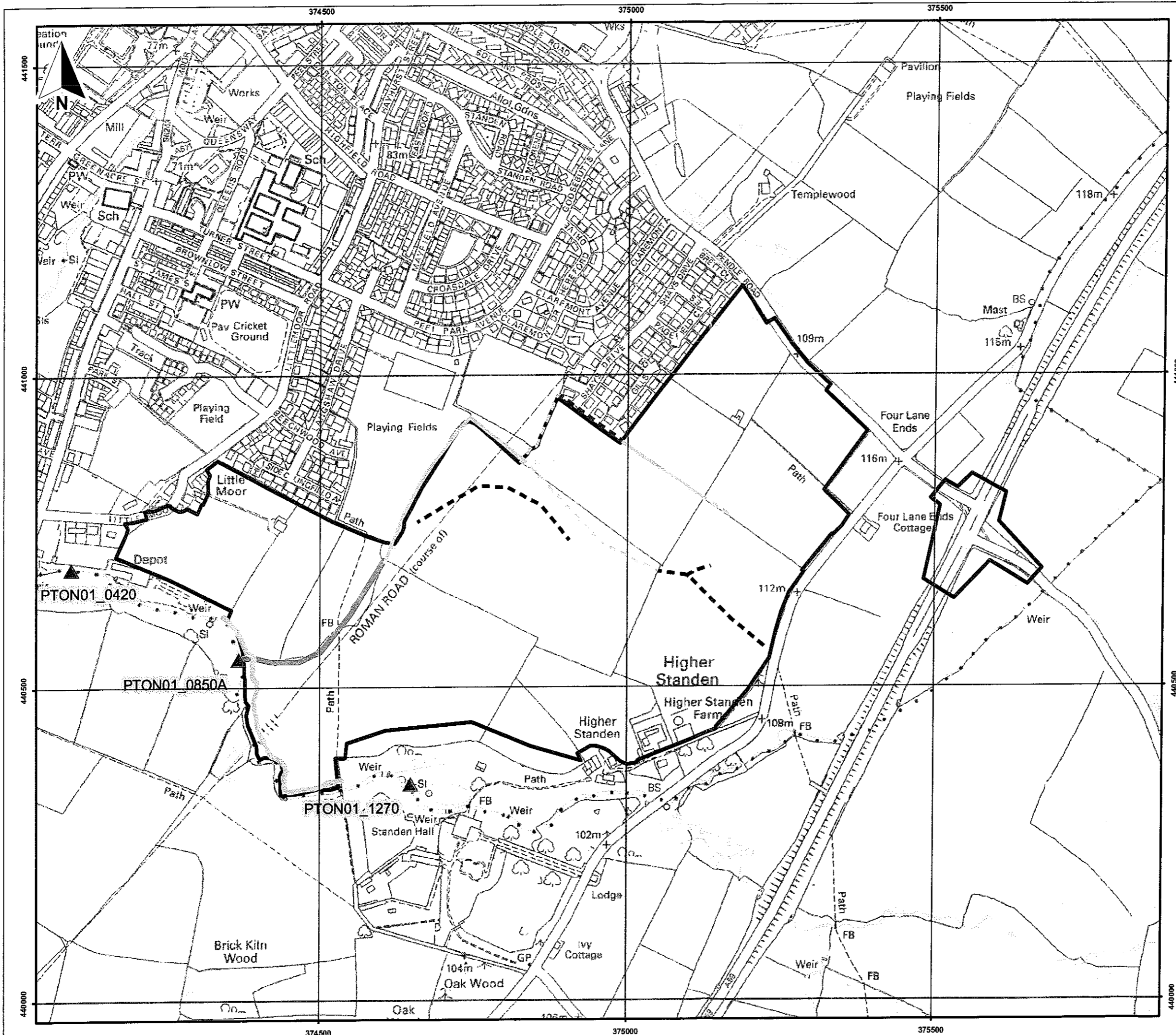
- Finished Floor Levels should be maintained a minimum of 150 mm above surrounding ground; and
- Low points within the site where water might pond should be avoided by careful profiling of the ground to allow overland drainage away from the buildings

3.6 Sewer Flooding

There are currently no known foul sewers running beneath the site (since the site is on greenfield land above the existing developed areas of Clitheroe). There are no sewer networks on higher land that could cause flooding of the site; therefore, it is considered that there is no current risk from sewer flooding.

The Services/Utilities report details discussions with United Utilities, which have indicated that a new section of trunk sewer would be required to serve the site. This would be constructed to the required standards (i.e. as specified in Sewers for Adoption, and agreed with United Utilities), and would join the existing network at a point where sufficient capacity is available.





- Key:**
- Site Application Boundary
 - Environment Agency Flood Model Nodes
 - Edge of 1 in 1000 year extent (Flood Zone 2)
- On Site Watercourse**
- Overland flow routes
 - Dry section
 - Piped section
 - Limited flow
 - Notable flow, spring fed

The main development site is the 50.1 ha plot in the west.

The four smaller areas to the east (14.3 ha total) comprise the total boundary of land, some of which will be used for the A59 junction improvements



Scale: 1:6 000 @ A3

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Land South of Clitheroe
Flood Risk Assessment

Figure 3.2
Site Hydrology and Flood Risk

October 2012
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4. Surface Water Management Strategy

This section summarises the existing surface water drainage at the site and details the proposed surface water management strategy for the new development.

4.1 Approach

The proposal is for the development of a greenfield site and therefore, attenuation of surface water run-off to greenfield rates is required. The Environment Agency has requested attenuation to a maximum Greenfield rate of 10 l/s/ha (see Appendix C). Attenuated flows will drain into the Pendleton Brook. Sustainable Drainage Systems (SuDS) will be utilised to meet this requirement.

4.2 Existing Drainage Arrangements

As the site is currently a greenfield site there are no existing surface water arrangements and the water is allowed to soak away or otherwise drain naturally. Section 2.1.3 identified that the soils are fairly impermeable in nature and result in a high runoff rate relative to more permeable soils.

4.3 Attenuation Calculations

4.3.1 Attenuation Volumes Required

The volume of storage required at the site has been calculated by determining the volume of surface water produced by the developed site for the 1% AEP critical storm duration event plus an allowance of 30% for climate change and the volume that can be discharged from the site over the same duration, assuming that the discharge rate is controlled to 10 l/s/ha.

Storage within the site has been designed to ensure that there will be no flooding within the site for rainfall events up to and including the 1% annual probability event over the lifetime of the development, which is normally required to be 100 years for residential development. A 30% increase in rainfall intensity has therefore been allowed to account for the effects of climate change up to 2115 (as given in table 5 in the technical guidance to the NPPF). Peak flows from the site will be limited to a peak flow of 10 l/s/ha as stipulated by the EA.

Storage requirements were determined for storms of varying duration to determine the critical storm duration giving the maximum storage volume and hence the storage requirement of the drainage system for the proposed development. The run-off and storage calculations are to be found in Appendix F. Modelling has been undertaken using version 12.6 of the Windes Hydraulic Modelling package.

The results of the runoff and storage calculations for the critical storm duration event are summarised in Table 4.1. It can be seen that a volume of around 26 600 m³ is required to attenuate the 1% AEP (1 in 100 year) plus climate change rainfall event to the greenfield

discharge rate. It should be noted that these are initial attenuation volume estimates. Once further details are known on the proposed site layout, more detailed modelling should be undertaken.

Table 4.1 Surface Water Storage Requirement at the Proposal Site

Criteria	Modelling Outputs
Site area	49.3 ha
Total estimated Impermeable area	31.643 ha
Maximum Allowable Discharge-based on a rate of 10l/s/ha as stipulated by the EA	316.43 l/s
Approximate Attenuation Required (m ³)	26.600 m ³
Annual Exceedance Probability	1% + 30% (climate change)
Critical Duration Event	1440 min winter storm

4.4 Selecting the Appropriate SuDS Strategy

4.4.1 Requirements of the Drainage System

The drainage system is required to limit the peak discharge rate from the site to 10 l/s/ha for all events up to the 1% AEP (1 in 100 year) rainfall event, including a 30% allowance for climate change. In order to do this it has been estimated that attenuation storage of around 26 600 m³ is required. This estimate will need to be refined as the final site detailed masterplan is developed.

Any piped drainage system provided as part of the development should be designed to cope with the 1:30 year storm event (3.33% AEP event) without surcharging. Whilst in more extreme events the drainage system may surcharge, site levels and gradients should be designed in such a way that overland flow generated from the site does not cause flooding of on-site properties or increase the risk of flooding outside the site for any event up to the 1 in 100 year + climate change event. The drainage system design and surcharging should be checked to verify if overland flow routes/ponding in these events could cause temporary surface water flooding, and the drainage/site design/floor levels adjusted accordingly. This in accordance with the guidance provided in Sewers for Adoption³. In addition the site should be profiled in such a way that all overland flows are contained on site and directed to the attenuation storage facilities. The drainage system should be based on a SuDs approach, looking to maximise drainage at source. As identified in Section 2.1.3, the site is underlain by interbedded limestone, mudstone, siltstone and sandstone. Overall, the geology at the site is not particularly permeable due to the presence of mudstone layers, and has been classified by the Environment Agency as a Secondary A aquifer. Therefore, SuDS techniques which primarily utilise infiltration techniques may not be suitable at this site. The potential low permeability of the soils and underlying geology, and groundwater levels needs to be considered and investigated prior to confirming whether any infiltration techniques should be utilised as part of the site's SuDS.

³ WRc Sewers for Adoption, A Design and Construction Guide for Developers. Sixth Edition 2006

Based on the information currently available, it appears that the geology is not sufficiently permeable for infiltration to be the main form of surface water control. Attenuation ponds should therefore be the primary means of surface water management. If shown to be suitable infiltration techniques could be used to supplement this and reduce the sizes of the attenuation basins.

The site is not located in a groundwater Source Protection Zone (SPZ), which means that (if feasible) both roof water and runoff from roads could be infiltrated to ground within this site. Infiltration tests should be carried out to confirm if infiltration is possible at the site.

The proposed site layout plan indicates that there is sufficient space for the required volume of attenuation basins, swales, rills and subsurface geocellular storage within the site.

SuDS solutions such as filter strips and permeable paving may also be appropriate on this site. These features are most effective at the source areas of the catchment, where runoff has not yet concentrated into larger flows. Filter strips comprise trenches filled with a permeable material into which run-off is collected from the edge of paved areas, then stored and conveyed. They are usually used next to roads and in parking areas. Permeable paving allows water to infiltrate into a sub-base. Water can be allowed to infiltrate into the underlying ground or the structure can be lined to prevent infiltration and promote storage and conveyance to another SuDS element.

4.5 The Proposed SuDS Solution

It is recommended that parking areas and residential access roads are constructed with sub surface geocellular storage systems to provide attenuation at source⁴. Flows from these sub surface storage areas should then drain via gravity to a series of swales, rills and small detention basins which will be placed in landscaped areas throughout each of the three proposed phases of the development. Flows from these will then drain to the Pendleton Brook and its un-named tributary.

As noted in Section 2.2 attenuation volumes have been calculated based on the assumption that 65% of the development will be impermeable, giving a total of 31 643 ha of impermeable area. Based on outline design a total of 26 600 m³ of storage will be required for the entire site, for phase 1 this will require 10 070 m³ of storage, phase 2 will require 10 320 m³ and phase 3 will require 6 210 m³. The phases approach to the proposed SuDS features will ensure that the development of the attenuation features progresses concurrently with the development phases.

At detailed design stage, once the development plans are finalised detailed modelling should be undertaken to confirm the exact run-off rates and attenuation requirements. If it is found that there are higher attenuation requirements than have been calculated at this outline stage there is scope to increase the surface water storage by providing additional geocellular storage.

⁴ CIRIA C697 The SuDS Manual, Chapter 16 Geocellular/modular systems.

It is recommended that some basic maintenance work is carried out along the on-site watercourse to remove any debris blockages (large dead trees, old fencing and other debris) that could significantly block the watercourse. It is proposed that a suitably qualified arboriculture specialist will be commissioned to undertake this work during the development stage. Upon completion of the development maintenance will become the responsibility of the adopting authority for the green spaces within the development.

5. Conclusions and Recommendations

5.1 Vulnerability

The vulnerability of the site is defined as 'more vulnerable' according to the categories set out in the NPPF. However as the site is located in Flood Risk Zone 1 it is not a requirement of the FRA to apply the Sequential and Exception Tests and the development is deemed appropriate for the location, in accordance with the NPPF.

5.2 Flood Risks and Mitigation

The site and the access routes to it are not located in a fluvial or tidal flood risk area and therefore safe access and egress can be maintained at all times, the adjacent areas of Clitheroe and the A59 being within Flood Zone 1.

Flood risk has been considered from all sources. The proposed development is not at risk of tidal flooding or flooding from main rivers. A small watercourse is present on site but this has been assessed as not posing a flood risk as it is situated in a small ravine and as the entire catchment (0.3 km²) will be developed and the runoff captured by the site's drainage system. The watercourse will be retained, and attenuated SuDS flows released to it. Some areas of potential groundwater emergence were identified, however the observed springs were all located within the on-site watercourse corridor within the ravine, and will be preserved as a green corridor. Groundwater flood risk is therefore not considered to be a significant risk to the proposed development. Finally, the potential for surface water to run-on from upslope areas was considered. The site was found to be on a ridge plateau, such that any flows generated upslope would run towards the Mearley Brook to the north of the site, or towards the Pendleton Brook to the south of the site – rather than across the site. This is therefore not considered to be a significant risk.

The impact of the developed site on runoff has been assessed, and recommendations provided for SuDS that will prevent any increase in downstream flood risk.

Should the proposals include basements then a site-specific investigation should be undertaken to assess the risk of groundwater ingress and if deemed necessary the development should be made resilient to groundwater.

5.2.1 SuDS

Section 4 has recommended potential options which could be implemented to ensure that surface water generated as a result of the development is managed and controlled to a discharge rate of 10 l/s/ha. This would ensure that the development does not increase the risk elsewhere and has appropriately managed the risk of surface water flooding to the development itself.

The outline SuDS detailed in Section 4 should be developed further as the development design progresses. Agreement on detailed design should be made with the adopting authority. Under the Flood and Water Management Act (FWMA), 2010 this will typically be the Lead Local

Flood Authority (LLFA), in this case Lancashire County Council. Under the Act, the LLFA is termed the 'SuDS Approving Body' (SAB) and should be consulted as the final designs are developed to ensure a final design suitable for implementation and adoption is constructed.

5.2.2 Finished Floor Levels and Ground Profiling

The Finished Floor Levels (FFLs) and surrounding ground within the development should be profiled in such a way to allow safe conveyance of overland flows in excess of the capacity of the drainage system and to avoid flooding the proposed properties or causing increased flood risk outside the site boundary. These flows may arise from seasonally high groundwater or from extreme storm events or blockages of the new drainage system.

In particular:

- FFLs should be maintained a minimum of 150 mm above surrounding ground; and
- Low points within the site where water might pond should be avoided by careful profiling of the ground to allow overland drainage away from the buildings and safe discharge to SuDS storage features without causing increased flood risk elsewhere. This may require some raised shallow bunds to convey water to the storage feature and prevent the water leaving the site in an uncontrolled manner.

5.3 Conclusions

The following conclusions can be drawn:

- The Sequential Test has been passed and the Exception test does not need to be applied to this FRA;
- All potential risks of flooding to the site have been assessed and relevant management options have been presented where necessary.

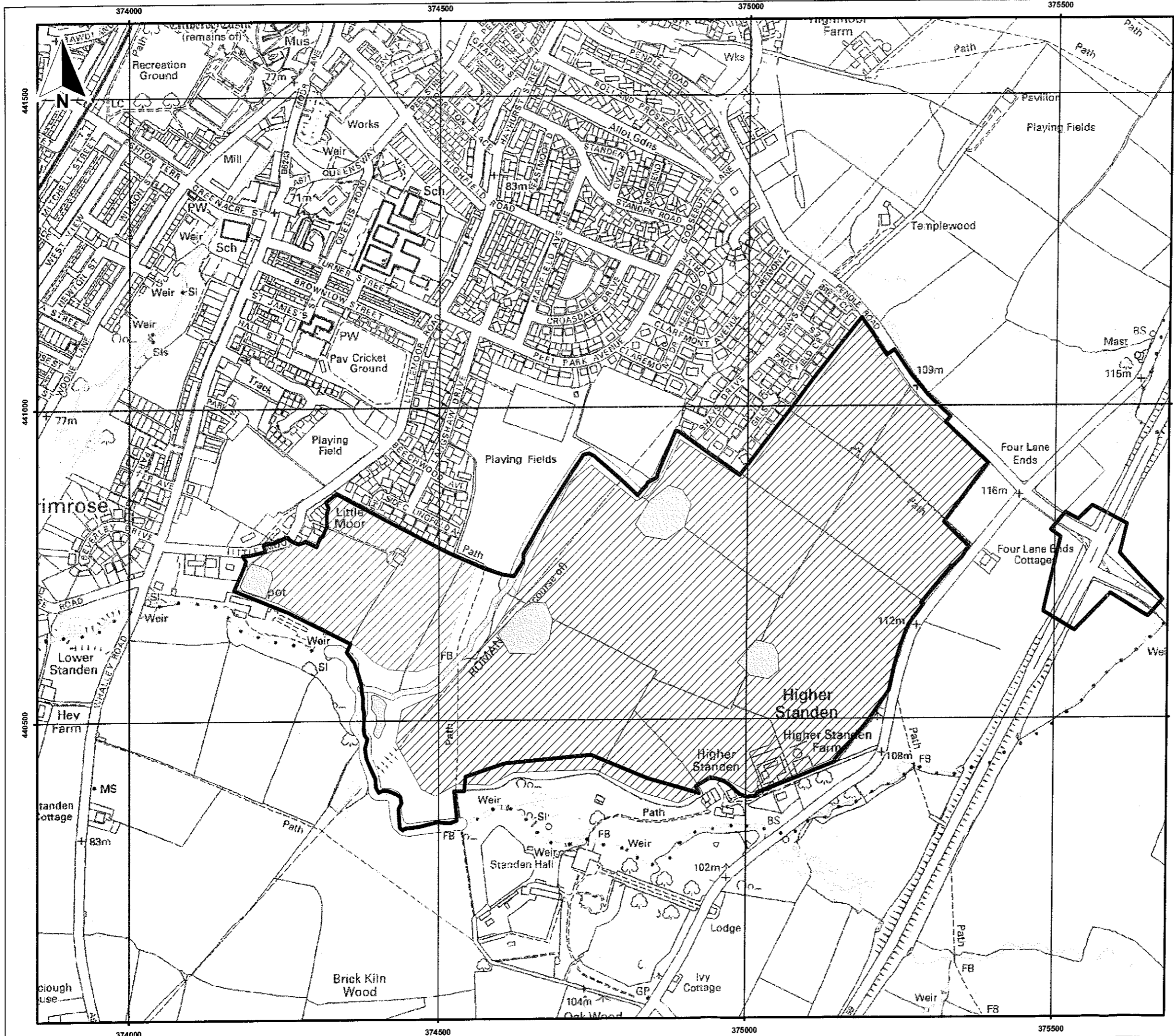
5.4 Recommendations

- Some reprofiling of the site should occur to remove local low points and ensure all runoff from the site enters the proposed SuDS drainage system and does not concentrate temporarily along overland flowpaths;
- All Finished Floor Levels should be set at least 150 mm above the local ground level at each development plot;
- A 10 m wide access corridor should be left alongside the Pendleton Brook. A 5 m wide access corridor should be left along the lower 800 m of the on-site watercourse from its confluence with Pendleton Brook;
- The proposed development will result in an approximate increase in impermeable surfaces of 31 ha. Based on preliminary estimates approximately 26 600 m³ of surface water storage would be required to attenuate run-off flows from this area up to the 1 in 100 year plus climate change event. This estimate will need to be refined as part of more detailed design. It is recommended that a series of

geocellular storage systems which drain to a set of swales and attenuation basins are developed to manage this water and release attenuated flows to the Pendleton Brook. The attenuation features should control the discharge rate to 10 l/s/ha;

- A site-specific investigation should be undertaken to determine the infiltration rate and whether infiltration SuDS options are appropriate for this site. It is however, considered unlikely that infiltration based SuDS will be suitable for this site, as the underlying geology is till (clay) over mainly mudstone. The attenuation based SuDS have been sized on the basis that they will be the main element of the site's SuDS. If infiltration is shown to be feasible, and for example source control measures such as permeable pavements and filter strips are used in parts of the site, it may be possible to reduce the requirements for attenuation storage as part of the final design; and
- Should the proposals include basements for the buildings, a site-specific investigation should be undertaken to assess the risk of groundwater ingress and if deemed necessary the development should be made resilient to groundwater.





Key:

- Site Application Boundary

Buffers

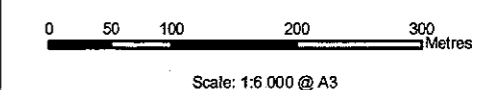
- On Site Spring Buffer
- On Site Watercourse 5m Easement
- Pendleton Brook 10m Easement

SuDS

- Catchment 1
- Catchment 2
- SuDS Attenuation Ponds

The main development site is the 50.1 ha plot in the west

The four smaller areas to the east (14.3 ha total) comprise the total boundary of land, some of which will be used for the A59 junction improvements



H:\Projects\Project Sub\olders\29421 SHR Standen Clitheroe\GIS\mxd\29421-S10.mxd

Trustees of Standen Estate
Land South of Clitheroe
Flood Risk Assessment

Figure 5.1
SuDS Layout and Watercourse Buffers

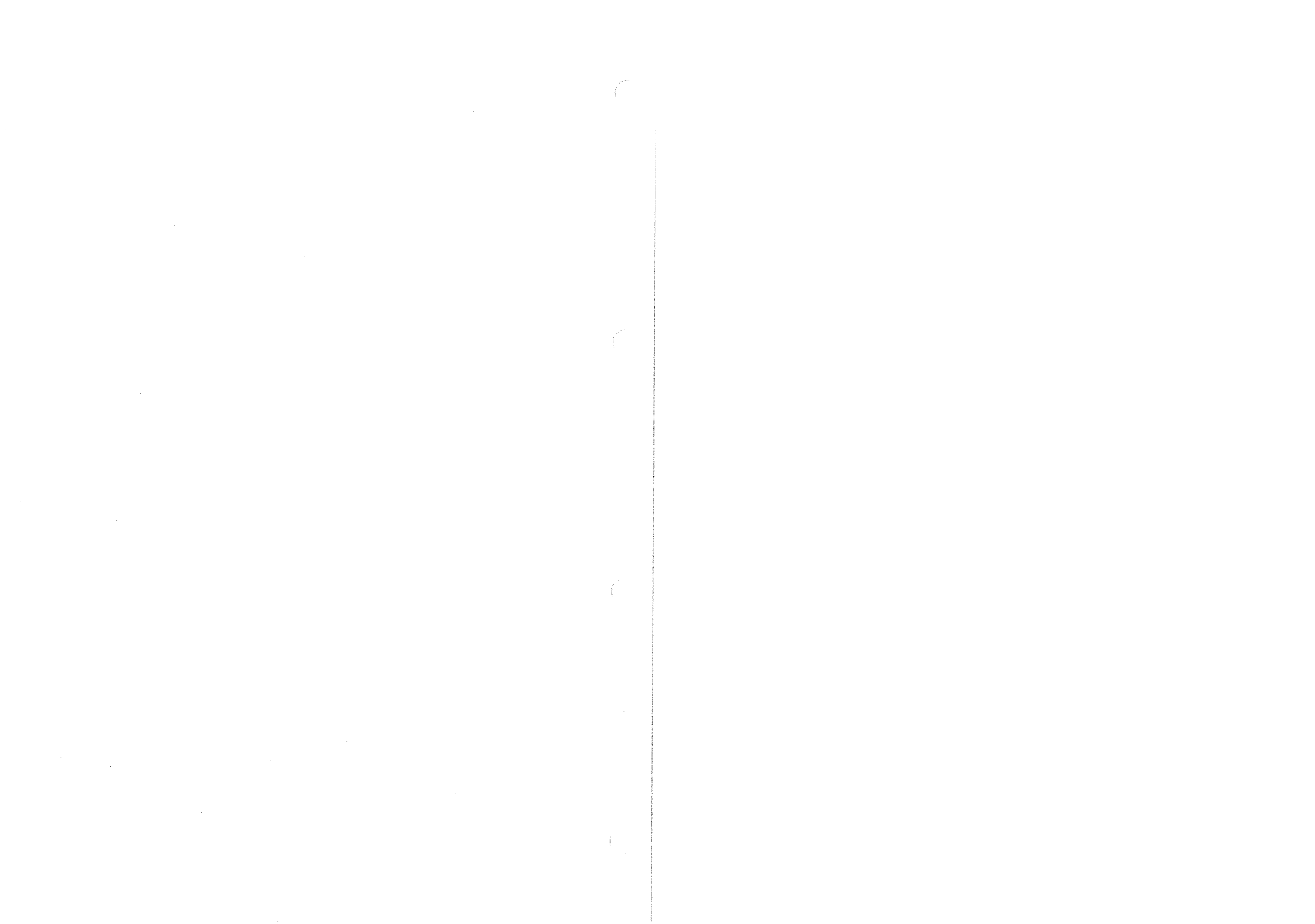
October 2012
29421-S10 brear





Appendix A Topographic Survey

8 Pages





Note:
The survey is plotted on a plane local
Grid. Orientation to National Grid.
All levels relate to Ordnance Datum,
achieved using the
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mapping purposes only and should not be
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approval of Survey Operations Ltd.
Contour information added to drawing 10/08/11.

SURVEY STATIONS			
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199	441000	442000	100.00
200	441000	442000	100.00

STANDARD REFERENCE & ABBREVIATIONS	
SP... Station Point	SP... Station Point
BM... Bench Mark	BM... Bench Mark
CP... Control Point	CP... Control Point
TP... Trough Point	TP... Trough Point
...

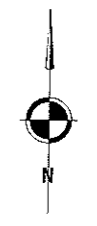
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5	6	7	8

Sheet Layout

Survey
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Email: sv@surveys.co.uk - www.surveys.co.uk

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Drawing Title	Topographical Survey of Land at: Ollithorpe
Sheet 1 of 5	
Scale(s)	1:500 Surveyor SI
Date	JUL 11 Drawn AC/GE
Job Number	11F152 Checked MH
Sheet Size & Dwg Number & Revision	A0 11F152/001



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STANDARD REFERENCE & ABBREVIATIONS

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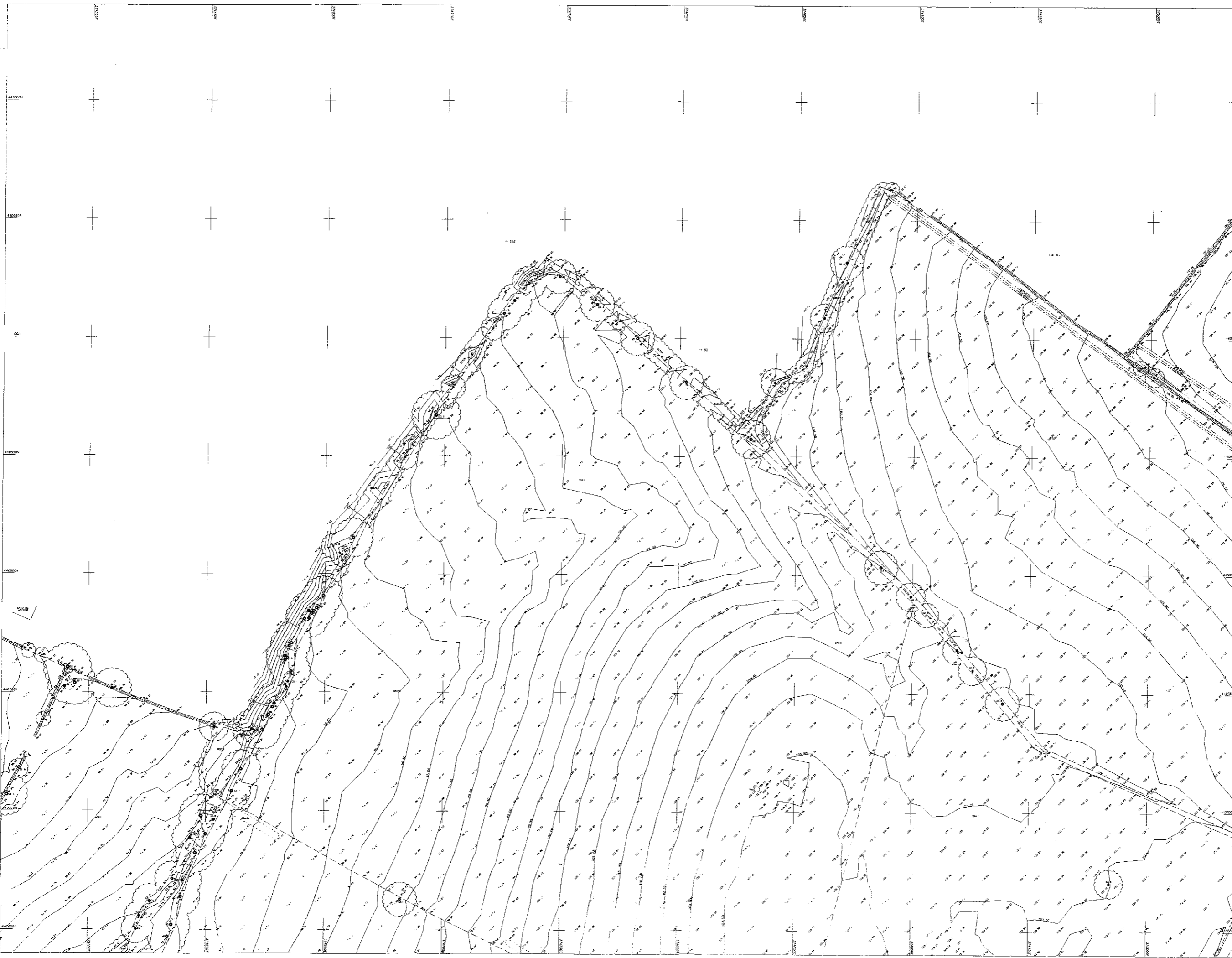
Smith Street, Sumerston, Levens WMB 6LN
 Tel: 01883 725652 Fax: 01885 518-6
 Email: mh@survops.co.uk www.survops.co.uk

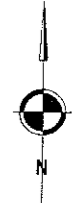
Client
Steven Abbott Associates

Drawing Title
**Topographical Survey of Land at:
 Clitheroe**
 Sheet 2 of 8

Scale	1:500	Survey	SI
Date	JUL 11	Drawn	AC/GE
Job Number	11F152	Checked	MH

Sheet Size & Orig Number & Revision
A0 11F152/002





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STANDARD REFERENCE & ABBREVIATIONS

AD	Asphalt Drive	AD	Asphalt Drive
AL	Asphalt Lane	AL	Asphalt Lane
AS	Asphalt Surface	AS	Asphalt Surface
BL	Bitumen Lane	BL	Bitumen Lane
BS	Bitumen Surface	BS	Bitumen Surface
CL	Concrete Lane	CL	Concrete Lane
CS	Concrete Surface	CS	Concrete Surface
DL	Durium Lane	DL	Durium Lane
DS	Durium Surface	DS	Durium Surface
EL	Emulsion Lane	EL	Emulsion Lane
ES	Emulsion Surface	ES	Emulsion Surface
FL	Furium Lane	FL	Furium Lane
FS	Furium Surface	FS	Furium Surface
GL	Gurium Lane	GL	Gurium Lane
GS	Gurium Surface	GS	Gurium Surface
HL	Hurium Lane	HL	Hurium Lane
HS	Hurium Surface	HS	Hurium Surface
IL	Iurium Lane	IL	Iurium Lane
IS	Iurium Surface	IS	Iurium Surface
KL	Kurium Lane	KL	Kurium Lane
KS	Kurium Surface	KS	Kurium Surface
LL	Lurium Lane	LL	Lurium Lane
LS	Lurium Surface	LS	Lurium Surface
ML	Murium Lane	ML	Murium Lane
MS	Murium Surface	MS	Murium Surface
NL	Nurium Lane	NL	Nurium Lane
NS	Nurium Surface	NS	Nurium Surface
OL	Ourium Lane	OL	Ourium Lane
OS	Ourium Surface	OS	Ourium Surface
PL	Ourium Lane	PL	Ourium Lane
PS	Ourium Surface	PS	Ourium Surface
QL	Qurium Lane	QL	Qurium Lane
QS	Qurium Surface	QS	Qurium Surface
RL	Rurium Lane	RL	Rurium Lane
RS	Rurium Surface	RS	Rurium Surface
SL	Surium Lane	SL	Surium Lane
SS	Surium Surface	SS	Surium Surface
TL	Turium Lane	TL	Turium Lane
TS	Turium Surface	TS	Turium Surface
UL	Uurium Lane	UL	Uurium Lane
US	Uurium Surface	US	Uurium Surface
VL	Vurium Lane	VL	Vurium Lane
VS	Vurium Surface	VS	Vurium Surface
WL	Wurium Lane	WL	Wurium Lane
WS	Wurium Surface	WS	Wurium Surface
XL	Xurium Lane	XL	Xurium Lane
XS	Xurium Surface	XS	Xurium Surface
YL	Yurium Lane	YL	Yurium Lane
YS	Yurium Surface	YS	Yurium Surface
ZL	Zurium Lane	ZL	Zurium Lane
ZS	Zurium Surface	ZS	Zurium Surface

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Sheet Layout

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Client	Steven Abbott Associates		
Drawing Title	Topographical Survey of Land at: Clitheroe		
Sheet 6 of 8			
Scale(s)	1:500	Surveyor	SI
Date	JUL 11	Drawn	AC/GE
JOB NUMBER	11F152	Checked	MH
Sheet Size & Dwg Number & Revision	A0 11F152/006		

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A6	BM	114.60	451710.00, 571710.00
A7	BM	114.95	451810.00, 571810.00
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A9	BM	115.65	452010.00, 572010.00
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STANDARD REFERENCE & ABBREVIATIONS

BM	Benchmark	TM	Topographical Mark
CG	Centre of Gravity	UL	Upper Limit
CO	Centre of Occupancy	WL	Water Level
CR	Centre of Road	X	Other
CS	Centre of Structure		
DA	Ditch		
DR	Ditch Road		
EA	Edge of Area		
EL	Edge of Line		
ER	Edge of Road		
ET	Edge of Top		
FA	Face of Area		
FL	Face of Line		
FR	Face of Road		
FT	Face of Top		
GA	Grade of Area		
GL	Grade of Line		
GR	Grade of Road		
GT	Grade of Top		
HA	Height of Area		
HL	Height of Line		
HR	Height of Road		
HT	Height of Top		
IA	Internal Area		
IL	Internal Line		
IR	Internal Road		
IT	Internal Top		
JA	Joint of Area		
JL	Joint of Line		
JR	Joint of Road		
JT	Joint of Top		
KA	Key of Area		
KL	Key of Line		
KR	Key of Road		
KT	Key of Top		
LA	Level of Area		
LL	Level of Line		
LR	Level of Road		
LT	Level of Top		
MA	Middle of Area		
ML	Middle of Line		
MR	Middle of Road		
MT	Middle of Top		
NA	Natural Area		
NL	Natural Line		
NR	Natural Road		
NT	Natural Top		
OA	Outer Area		
OL	Outer Line		
OR	Outer Road		
OT	Outer Top		
PA	Point of Area		
PL	Point of Line		
PR	Point of Road		
PT	Point of Top		
QA	Quality of Area		
QL	Quality of Line		
QR	Quality of Road		
QT	Quality of Top		

1	2	3	4
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Sheet Layout



Smith Street, Salford, Lancs M6 6EN
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Email: info@surops.co.uk www.surops.co.uk



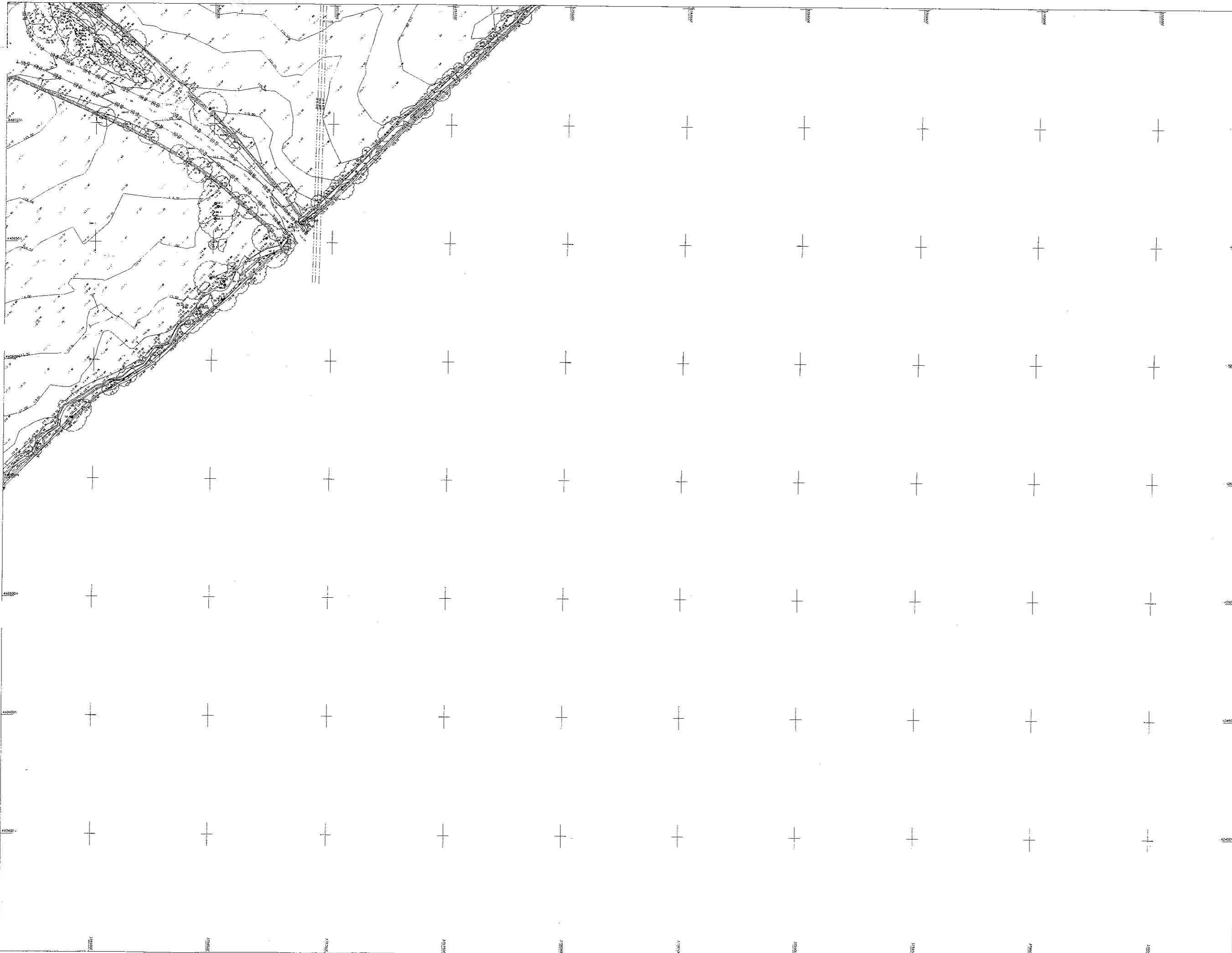
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Steven Abbott Associates

Drawing Title:
Topographical Survey of Land at:
Clitheroe

Sheet 7 of 8

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Date: JUL 11	Drawn: AC/GE
Job No: 11F152	Checked: MH

Sheet No & Dwg Number & Revision
AO 11F152/007



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150	150	150.10

STANDARD REFERENCE & ABBREVIATIONS

AB	Abutment	AD	Asphalt
AC	Asphalt Concrete	AE	Asphalt Emulsion
AD	Asphalt	AF	Asphalt Finish
AE	Asphalt Emulsion	AG	Asphalt Gravel
AF	Asphalt Finish	AH	Asphalt HMA
AG	Asphalt Gravel	AI	Asphalt Interlock
AH	Asphalt HMA	AJ	Asphalt Joint
AI	Asphalt Interlock	AK	Asphalt Key
AJ	Asphalt Joint	AL	Asphalt Layer
AK	Asphalt Key	AM	Asphalt Mixture
AL	Asphalt Layer	AN	Asphalt Network
AM	Asphalt Mixture	AO	Asphalt Overlay
AN	Asphalt Network	AP	Asphalt Pavement
AO	Asphalt Overlay	AQ	Asphalt Patch
AP	Asphalt Pavement	AR	Asphalt Road
AQ	Asphalt Patch	AS	Asphalt Seal
AR	Asphalt Road	AT	Asphalt Surface
AS	Asphalt Seal	AU	Asphalt Treatment
AT	Asphalt Surface	AV	Asphalt Underlayment
AU	Asphalt Treatment	AW	Asphalt Water
AV	Asphalt Underlayment	AX	Asphalt Work
AW	Asphalt Water	AY	Asphalt Zone
AX	Asphalt Work	AZ	Asphalt Zone
AY	Asphalt Zone		
AZ	Asphalt Zone		

1	2	3	4
5	6	7	8

Sheet Layout

Survey

OPERATIONS

57th Street, Summerville, South Carolina 29586
 Tel: 843.725.6622 Fax: 843.725.6622
 Email: info@surveyops.com www.surveyops.com

Client: Steven Abbott Associates

Drawing Title: Topographical Survey of Land at: Clitherow

Sheet 6 of 8

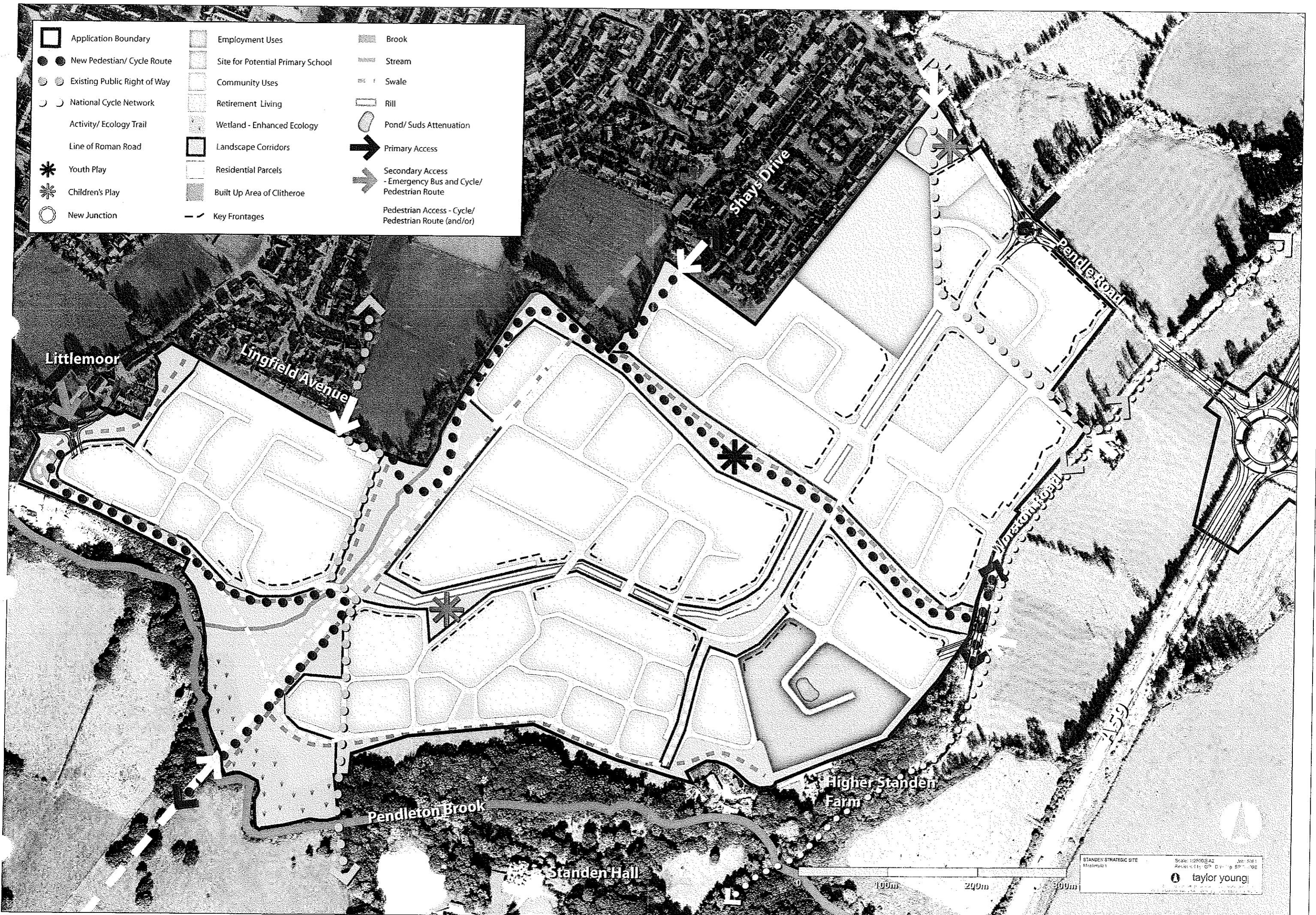
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Date: JUL 11	Drawn: AC/GE
Job Number: 11F152	Checked: MH

Sheet 6 of 8 by Kameer & Revision
 AO 11F152/008

Appendix B Illustrative Proposed Site Layout

1 Page

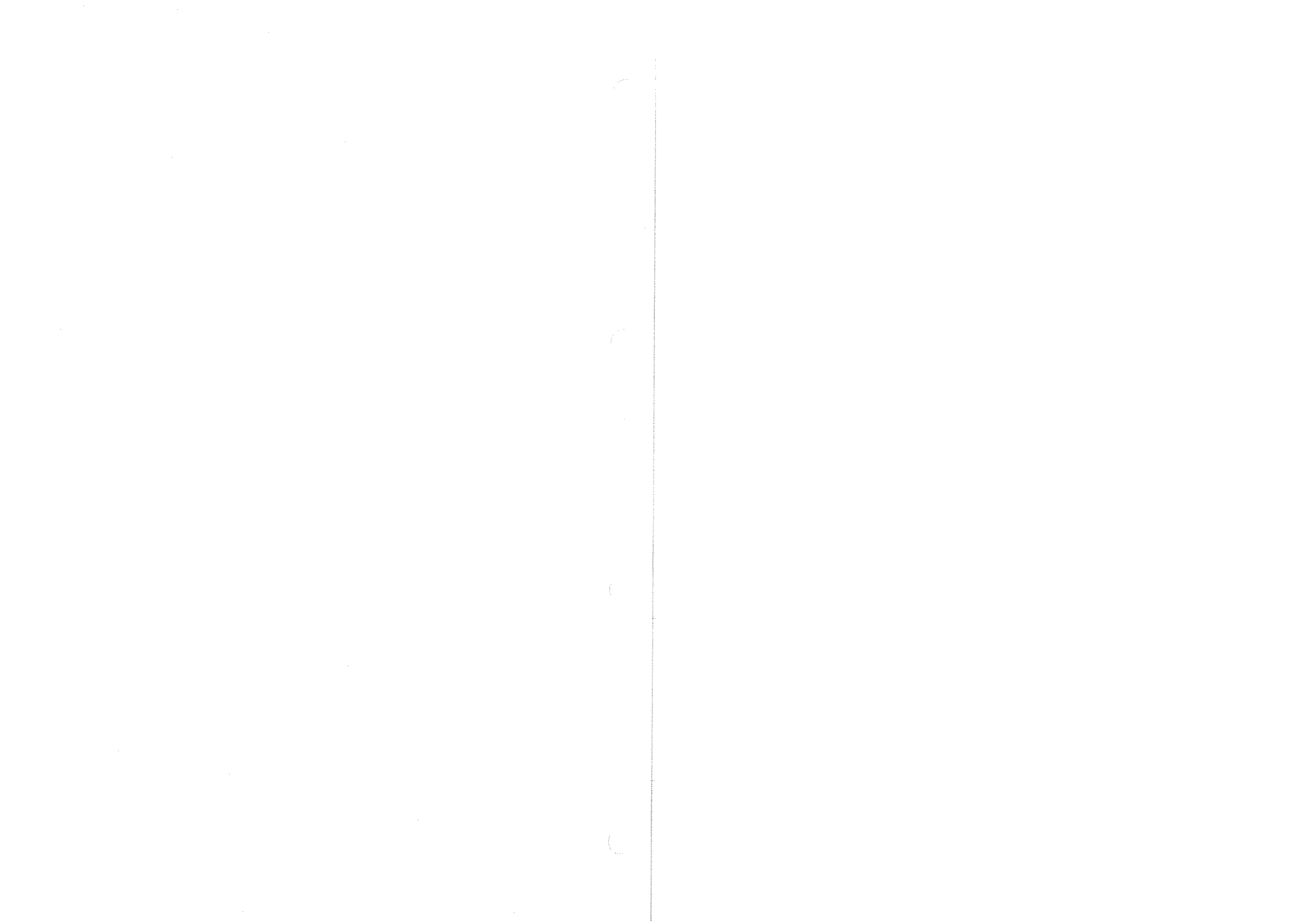
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	Existing Public Right of Way		Community Uses		Swale
	National Cycle Network		Retirement Living		Rill
	Activity/ Ecology Trail		Wetland - Enhanced Ecology		Pond/Suds Attenuation
	Line of Roman Road		Landscape Corridors		Primary Access
	Youth Play		Residential Parcels		Secondary Access - Emergency Bus and Cycle/ Pedestrian Route
	Children's Play		Built Up Area of Clitheroe		Pedestrian Access - Cycle/ Pedestrian Route (and/or)
	New Junction		Key Frontages		





Appendix C Evidence of Consultation Process

15 Pages





"NW North Preston ,
Information Requests "
<nwnorthpreston@environment-agency.gov.uk>

03/04/2012 11:29

To: "richard.breakspear@amec.com"
<richard.breakspear@amec.com>
cc: "NW North Preston, Information Requests"
<nwnorthpreston@environment-agency.gov.uk>
Subject: PRE3187_response

Dear Richard

**PUBLIC REGISTER AND ENVIRONMENTAL INFORMATION REQUEST
Site at Standen, Clitheroe, Lancashire**

Thank you for your email regarding the above site. Please find our response below. Requests for recorded information are generally governed by the Freedom of Information Act 2000 (FOIA). The information you have requested is environmental and is therefore exempt from the provisions of FOIA by FOIA s.39(1). We have therefore considered your request under the Environmental Information Regulations 2004 (EIR).

Your enquiry

You requested flood data in support of a proposed development scheme on a greenfield site at Standen, Clitheroe, Lancashire.

We understand that AMEC are currently carrying out a hydrological assessment of a proposed site (Flood Risk Assessment and Environmental Impact Assessment) on behalf of the developers. You requested a range of hydrological information associated with the site. The site is immediately west of the A59, (see attached plan). The approximate grid reference for the centre of the area of interest is: SD 74917 40684

The data you are interested in is as follows:

- Flood extents and flood levels for adjacent watercourses
- Any other flood related information relevant to this site which the EA may hold - in particular with regards to: groundwater flooding /surface water flooding
- Details of required surface water attenuation - i.e. infiltration to manage all runoff at this site?
- Flood Extents/Depth data for the site i.e. Flood Zone 3 and 2, and relevant flood depths, if available
- Flow data for surface watercourses within the site boundary or downstream (Pembleton Brook and tributaries);
- Water quality data and river classifications for the local watercourses;
- Presence and location of any known surface water or groundwater abstractions within 1km of the site boundary;
- Information about historic abstractions;
- Groundwater level information for nearby monitoring wells;
- Details of discharge consents on site, or within 1km;
- Details of watercourses designated for fisheries;
- Information on any local SSSIs or SACs.

Our response

Our responses are highlighted in bold

- Flood extents and flood levels for adjacent watercourses
- **Please see attached**
- Any other flood related information relevant to this site which the EA may hold - in particular with regards to: groundwater flooding /surface water flooding
- **With regard to groundwater flooding or surface water flooding please contact Graham Todd graham.todd@lancashire.gov.uk**
- Details of required surface water attenuation - i.e. infiltration to manage all runoff at this site?
- **Please see attached email that we sent to your colleague Stewart Griffiths**
- Flood Extents/Depth data for the site i.e. Flood Zone 3 and 2, and relevant flood depths, if available
- **Please see attached**
- Flow data for surface watercourses within the site boundary or downstream (Pembleton Brook and tributaries);
- **We do not have any flow data for Pendleton Brook or for its tributaries**
- Water quality data and river classifications for the local watercourses;
- **We do not have any water quality data or river classifications for the local watercourses**
- Presence and location of any known surface water or groundwater abstractions within 1km of the site boundary;
- **Attached report from NALD showing a live surface water abstraction on the 1k radial search SD 74917 40684.**
- Information about historic abstractions;
- **We have checked our records and we have no information about historic abstractions**
- Groundwater level information for nearby monitoring wells;
- **We have checked our records and we have no information about groundwater level information for nearby monitoring wells**
- Details of discharge consents on site, or within 1km;
- **Information on discharge consents on the site or within 1km is attached**
- Details of watercourses designated for fisheries;
- **We have checked our records and we have no records of any watercourses designated for fisheries in this area**
- Information on any local SSSIs or SACs.
- **We have checked our records and we have no records of any local SSSI's or SACs in this area**

Rights of appeal

We hope that our response has addressed all of the questions that you have asked. However, if you are not satisfied with our response to your request for information, you can contact us to ask for our decision to be reviewed. If you are still not satisfied following this, you can make an appeal to the Information Commissioner, who is the statutory regulator for Freedom of Information. Their contact details are: Office of the Information Commissioner, Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF.

Tel: 01625 545700. Fax: 01625 524 510

email: mail@ico.gsi.gov.uk.

Website: <http://www.ico.gov.uk>

Yours sincerely

Mark Goucher
Customer Services Officer

Richard Fairclough House, Knutsford Road, Warrington WA4 1HT

mark.goucher@environment-agency.gov.uk

01925 542980

Int 721 2980

www.environment-agency.gov.uk

From: richard.breakspear@amec.com [mailto:richard.breakspear@amec.com]

Sent: 10 February 2012 15:56

To: Enquiries, Unit

Subject: Ref 120213/AR07 Data Request for site at Standen, Clitheroe, Lancashire

Click [here](#) to report this email as spam.

Dear Sir/Madam,

This is a request for flood data in support of a proposed development scheme on a greenfield site at Standen, Clitheroe, Lancashire. Could you please register this request on your system and forward to the appropriate Environment Agency office.

AMEC are currently carrying out a hydrological assessment of a proposed site (Flood Risk Assessment and Environmental Impact Assessment) on behalf of the developers. As such I am writing to request a range of hydrological information associated with the site. The site is immediately west of the A59, (see attached plan). The approximate grid reference for the centre of the area of interest is: SD 74917 40684

Or see:

[http://gridreferencefinder.com/?gr=SD7491740684%7CPoint s E%7C0&z=15&v=h&t=Point s E](http://gridreferencefinder.com/?gr=SD7491740684%7CPoint%20s%20E%7C0&z=15&v=h&t=Point%20s%20E)

The data we are interested in is as follows:

- Flood extents and flood levels for adjacent watercourses
- Any other flood related information relevant to this site which the EA may hold - in

- particular with regards to: groundwater flooding /surface water flooding
- Details of required surface water attenuation - i.e. infiltration to manage all runoff at this site?
 - Flood Extents/Depth data for the site i.e. Flood Zone 3 and 2, and relevant flood depths, if available
 - Flow data for surface watercourses within the site boundary or downstream (Pembleton Brook and tributaries);
 - Water quality data and river classifications for the local watercourses;
 - Presence and location of any known surface water or groundwater abstractions within 1km of the site boundary;
 - Information about historic abstractions;
 - Groundwater level information for nearby monitoring wells;
 - Details of discharge consents on site, or within 1km;
 - Details of watercourses designated for fisheries;
 - Information on any local SSSIs or SACs

If there is a charge for this information please let me know and I will arrange for payment to be made as soon as possible.

Best regards,

Richard

Dr Richard Breakspear
Senior Consultant (Flood Risk, Hydrology and Geomorphology)

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Direct +44 (0)1454 822 008 mobile +44 (0)7966 869343

richard.breakspear@amec.com

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Flood Map (PRE3187) - Standen, Clitheroe

National Grid Reference:
SD 74915 40685

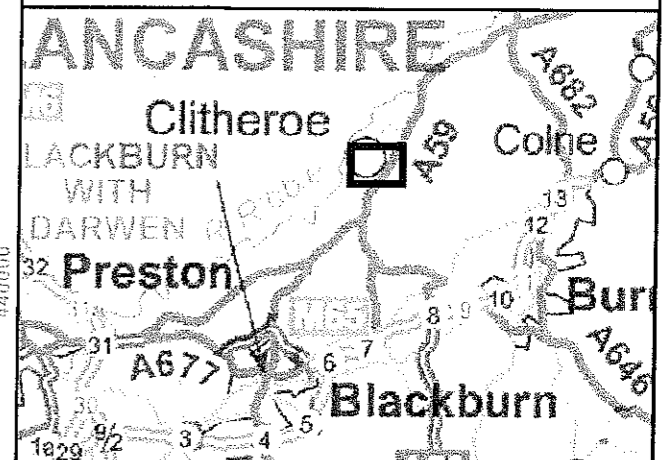
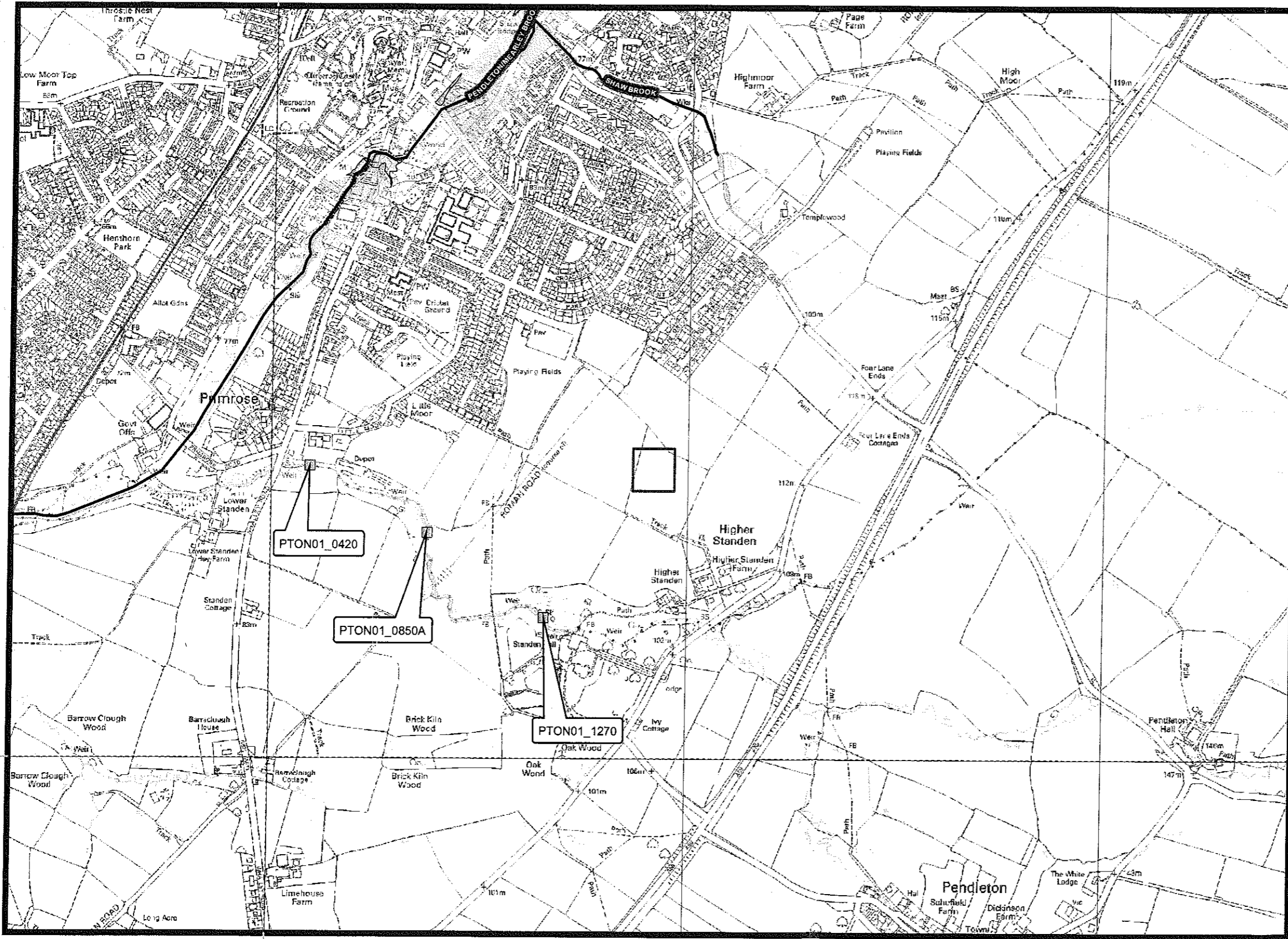


North West Region - North Area

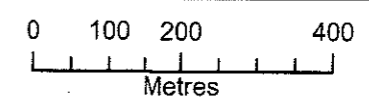
Lutra House, Dodd Way, Off Seedlee Road,
Walton Summit, Bamber Bridge Preston, PR5 8BX
Tel: 03708 506 506 | www.environment-agency.gov.uk

Produced by
Flood Risk Management

Map produced on:
9th March 2012



The datasets used in this plan may not have been audited. The Agency cannot ensure that the data in its possession will always be accurate, up to date or valid but the Agency will use reasonable care to ensure an accurate copy of the data. The accompanying disclaimer should be used in conjunction with this plan.



Flood Zone 3: Shows the area that could be affected by flooding from rivers or the sea, if there were no defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) chance or greater of happening each year.
- or from a river by a flood that has a 1% (1 in 100) chance or greater of happening each year.

Flood Zone 2: Shows the additional extent of an extreme flood from rivers or the sea, if there were no defences. These outlying areas are likely to be affected by a major flood, that has up to a 0.1% (1 in 1000) chance of occurring each year

Historic Flooding:
No relevant historic flooding could be found.
Other Information:
See Table 01 for details at node points.

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Model Node	Levels (mAOD) at Return Period:							
	Q5	Q10	Q25	Q50	Q75	Q100	Q200	Q1000
PTON01_1270	90.70	90.80	90.90	90.98	91.03	91.06	91.14	91.84
PTON01_0850A	80.43	80.50	80.58	80.65	80.70	80.74	80.83	81.43
PTON01_0420	71.62	71.67	71.77	71.87	71.94	71.99	72.15	73.52
Table 01								

Dawson, Emily

From: Worswick, Colin
Sent: 03 April 2012 10:33
To: NW North Preston, Information Requests
Subject: PRE3187_DFR 31936 - Land at Higher Standon, Clitheroe - FRA

Colin Worswick

Development and Flood Risk Engineer
North Area, North West Region
01772 714259
07741 019565

From: Worswick, Colin
Sent: 22 March 2012 10:02
To: 'stewart.griffiths@amec.com'
Subject: RE: 31936 - Land at Higher Standon, Clitheroe - FRA

Stewart,

I can confirm that both sites lie within Flood Zone 1. We are not aware of any flooding incidents, however you are advised to contact Ribble Valley Borough Council who may have more detailed local records. Surface water run-off must be restricted to existing greenfield rates which is 10l/s/hectare. You will require Flood Defence Consent to culvert or divert any watercourses.

Regards

Colin Worswick

Development and Flood Risk Engineer
North Area, North West Region
01772 714259
07741 019565

From: stewart.griffiths@amec.com [mailto:stewart.griffiths@amec.com]
Sent: 20 March 2012 14:28
To: Worswick, Colin
Subject: 31936 - Land at Higher Standon, Clitheroe - FRA

Click [here](#) to report this email as spam.

FAO: Colin Worswick

I understand that you cover the Clitheroe Area.

We are undertaking a Flood Risk Assessment for a couple of development sites in Clitheroe - see attached layout plan(s)

a) **Site 1 - 4 Acre Site**(Post Code BB7 1HF)

The site is located between Little Moor and Little Moor View as indicated by the attached plan.

b) **Site 2 - Main Development Site**(covering an area of approx 70 ha)

Located to the east of Little Moor Road, as indicated on the Drawing.

Could you advise me whether there are any flooding restrictions on this site, for our inclusion in our Flood Risk Assessment Report?

We understand that the site is located in a Flood Zone 1 Area, but could you confirm this.

Any queries then contact me on the number below.

Regards

Stewart Griffiths
Senior Civil Engineer
AMEC

Amec Environment & Infrastructure UK Limited
Windsor House, Gadbrook Road Northwich CW9 7TN, UK
Tel +99 (0)1606 354800
Direct +44 (0)1606 354812 mobile +44(0)7896 213922
stewart.griffiths@amec.com
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----- Forwarded by Stewart Griffiths/NOR/ENTEC/NWG on 20/03/2012 14:03 -----

From: "Welsby, Cliff" <cliff.welsby@environment-agency.gov.uk>
To: stewart.griffiths@amec.com' <stewart.griffiths@amec.com>
Date: 15/03/2012 12:15
Subject: RE: 31936 - Land at Higher Standon Clitheroe - FRA

Stewart.

Colin Worswick is the engineer for Clitheroe area.

Tel 07741 019565

Cliff.

From: stewart.griffiths@amec.com [<mailto:stewart.griffiths@amec.com>]
Sent: 14 March 2012 10:08
To: Welsby, Cliff
Cc: Carter, Philip A; andrew.worsdale@amec.com
Subject: 31936 - Land at Higher Standon, Clitheroe - FRA

Hi Cliff,

We have a couple of Greenfield sites in Clitheroe where we have been asked to undertake an Outline FRA.

Who is the EA contact for this area?

Regards

Stewart Griffiths
Senior Civil Engineer
AMEC

Amec Environment & Infrastructure UK Limited
Windsor House, Gadbrook Road, Northwich CW9 7TN UK
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Direct +44 (0)1606 354812 mobile +44(0)7896 213922
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From: 'Welsby, Cliff' <cliff.welsby@environment-agency.gov.uk>
To: 'stewart.griffiths@amec.com' <stewart.griffiths@amec.com>
Cc: Carter, Philip A' <PCARTER@environment-agency.gov.uk>
Date: 07/03/2012 10:28
Subject: RE: 31936 - Site at Lightfoot Lane, Fulwood, Preston - FRA

Stewart.

As detailed by Philip on site attenuation will be required for surface water at existing "green field" rates usually considered to be 10l/sec/hect.

Any works to the culverted watercourse may require Agency formal consent.

Please contact me again should you need to apply for any consents.

Regards

Cliff

From: stewart.griffiths@amec.com [<mailto:stewart.griffiths@amec.com>]
Sent: 07 March 2012 09:59

To: Welsby, Cliff
Cc: andrew.worsdale@amec.com; sammy.spaine@amec.com
Subject: 31936 - Site at Lightfoot Lane, Fulwood, Preston - FRA

Cliff,

Further to Phil Carter's e:mail below, are you aware of any site specific issues for the site at Lightfoot Lane (location plan attached) which will need to be included in the FRA?

Many Thanks

Stewart Griffiths
Senior Civil Engineer

AMEC

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Windsor House, Gadbrook Road Northwich CW9 7TN UK
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----- Forwarded by Stewart Griffiths/NOR/ENTEC/NWG on 07/03/2012 09:53 -----

From: 'Carter Philip A' <PCARTER@environment-agency.gov.uk>
To: "stewart.griffiths@amec.com" <stewart.griffiths@amec.com>
Cc: 'Welsby Cliff' <cliff.welsby@environment-agency.gov.uk>
Date: 07/03/2012 09:47
Subject: RE: 31936 - Site at Lightfoot Lane, Fulwood Preston - FRA

Stewart

The engineer who covers the area is Cliff Welsby - you can contact him directly on 01772 714016 but I've also copied him into this e-mail.

I can confirm that the area is Flood Zone 1 and any development must ensure that surface water run-off from the site is restricted to existing rates (to be identified in the FRA). From the OS map of the area, there is an ordinary watercourse flowing through the site in a northerly direction, under the motorway, in culvert. The risk of flooding due to blockage or under capacity of the watercourses and culverts on site will need to be considered in the FRA, as will the potential for removal of any culverts that could reduce flood risk

I would recommend contacting Cliff to see if he has any other site specific issues that would need to be considered in the FRA. Kind regards

Philip

Philip Carter
Planning Liaison Officer
Environment Agency
PO Box 519
South Preston
PR5 8GD
01772 714219



Flooding data Request - Standen Road, Clitheroe

Finch, Peter o richard.breakspear

14/02/2012 14:42

Richard,

Thank you for your Email dated 13th February 2012.

There are no major recorded flooding incidents on Standen Road, except for the occasional blocked gully that can cause a localised flooding problem.

Regards
Peter Finch
Principal Engineer (Ribble Valley)
Environment Services East
Lancashire County Council
01254 770960

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RE: Sewer flooding data request , site at Standen , Clitheroe , Lancashire

Planning Liaison o richard.breakspear

20/02/2012 12:23

Hello Richard

Information as requested

DG5 Sewer Flooding

I have checked our records and have found a DG5 flooding issues within the immediate vicinity of the proposed development. The reported issue is on Turner Street, Clitheroe.

Please note that United Utilities Water plc (UUW) can only record and check flooding events which are reported to us and we have to comply with our Regulators instructions on the qualification of flooding events to place on the 'at risk' register

This assesment does not include any sewer flooding events caused by blockages or collapses which are the result of third party actions, natural events or other actions over which UUW has no control and not a facet of sewer capacity.

If I can be of any further assistance in the meantime then please don't hesitate to get in touch.

Regards
Graham Perry

From: richard.breakspear@amec.com [mailto:richard.breakspear@amec.com]

Sent: 13 February 2012 10:15

To: Planning Liaison

Subject: Sewer flooding data request, site at Standen, Clitheroe, Lancashire

Hi,

I would like to request information on past/existing incidences of sewer flooding in support of a Flood Risk Assessment being prepared for a residential development site at Standen, Clitheroe, Lancashire.

I've checked on your website, under Developer Enquiries (<http://www.unitedutilities.com/Wastewaterconnections.aspx>) and cannot find a link to the information I require.

The site is immediately west of the A59, (see attached plan). The approximate grid reference for the centre of the area of interest is: SD 74917 40684

Or see:

<http://gridreferencefinder.com/?gr=SD7491740684%7CPoint s E%7C0&z=15&v=h&t=Point s E>

Best regards,

Richard

Dr Richard Breakspear

Dawson, Emily

From: Griffiths, Stewart on behalf of Dawson, Emily
Sent: 26 March 2012 10:13
To: Dawson, Emily
Subject: 29421 - Land at Higher Standon, Clitheroe, Lancs

Note the response I received from UU last week, for your information

Regards

Stewart Griffiths
Senior Civil Engineer
AMEC
Amec Environment & Infrastructure UK Limited Windsor House, Gadbrook Road, Northwich CW9 7TN, UK Tel +99
(0)1606 354800 Direct +44 (0)1606 354812 mobile +44(0)7896 213922 stewart.griffiths@amec.com
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|----->
| From: |
|----->
>-----|
"Perry, Graham" <Graham.Perry@uuplc.co.uk>
|----->
| To: |
|----->
>-----|
<stewart.griffiths@amec.com>
|----->
| Date: |
|----->
>-----|
19/03/2012 16:21
|----->
| Subject: |
|----->
>-----|
RE: 29421 - Land at Higher Standon, Clitheroe, Lancs

Hello Stewart

Further to our discussion, I can confirm that we would accept free foul discharge from 50 domestic units into the 300mm combined sewer crossing the site but we would not accept any surface water. Under the terms of Building regulation H3 & PPS25, you must discharge to either soakaway on site or to the nearby watercourse.

We would have no objection to you diverting the existing 300mm combined sewer that crosses the site providing that you enter into a Section 185 Diversion agreement before starting

"United Utilities Water plc (UJW) will provide information on connection points and maximum permitted discharge rates to public sewers in response to enquiries by developers and in response to Planning Applications where Planning Authorities have elected to consult UJW on drainage matters.

However, the points of connection and discharge rates cannot be allocated and reserved for a particular development. UJW reserves the right to revise the connection point and discharge rate current at the time that a formal application for connection to public sewer is made, in order to take account of possible changes in discharges to the public sewer between the date of the enquiry and the date of the connection being required"

Regards

Graham Perry

From: stewart.griffiths@amec.com [mailto:stewart.griffiths@amec.com]
Sent: 13 March 2012 13:17
To: Perry, Graham
Subject: 29421 - Land at Higher Standon, Clitheroe, Lancs

Graham,

FYI

I don't think you received this drawing last time!

Regards

Stewart Griffiths
Senior Civil Engineer
AMEC
Amec Environment & Infrastructure UK Limited Windsor House, Gadbrook Road, Northwich CW9 7TN, UK Tel +99 (0)1606 354800 Direct +44 (0)1606 354812 mobile +44(0)7896 213922 stewart.griffiths@amec.com
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----- Forwarded by Stewart Griffiths/NOR/ENTEC/NWG on 13/03/2012 13:20

From: Stewart Griffiths/NOR/ENTEC/NWG

To: "Perry, Graham" <Graham.Perry@uuplc.co.uk>

Date: 13/03/2012 13:09

Subject: 29421 - Land at Higher Standon, Clitheroe, Lancs

Hello Stewart,

My initial thoughts would be that this is a significant development that will have a major impact to our network and receiving treatment works.

Surface Water

All surface water from this site must be drained directly soakaway / SUDS or to the watercourses running through the site. You will need to discuss your proposals with the EA to agree discharge points / flow rates

Foul

We are currently carrying out a detailed assessment of the area and we should know the impact that your site has to our assets in the near future.

For your purposes I would suggest that will be capacity issues on the network & treatment works.

Regards

Graham Perry

From: stewart.griffiths@amec.com [mailto:stewart.griffiths@amec.com]
Sent: 05 January 2012 16:34
To: Perry, Graham
Subject: 29421 - Land at Higher Standon, Clitheroe, Lancs

Hi Graham,

Happy New Year!

We have a site in your area which we are assessing from a drainage capacity point of view

The location of the site is attached (Postcode BB7 1PP) for your information, which is located to the South East of Clitheroe.

We are in the process of requesting Sewer Record information from UU

Anticipated development will consist of approx 1040 residential properties and 7500 m2 of office space

Could you advise me on the capacity of the local sewerage systems to accommodate such a development?



Appendix D Photographs

22 Pages

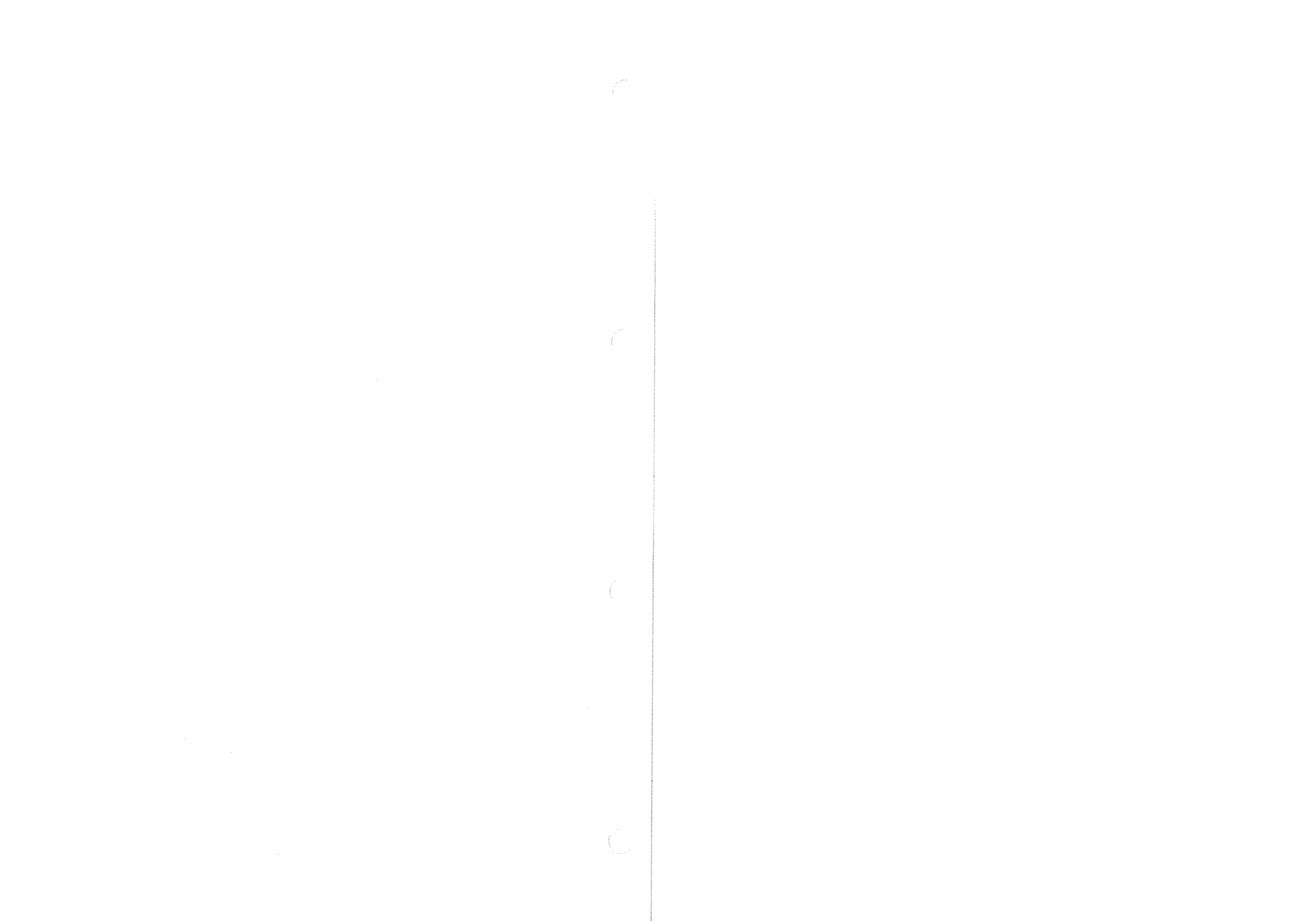


Plate D.1 View west from eastern corner of site



Plate D.2 View south-west from eastern corner of site



Plate D.3 View East from centre of site



Plate D.4 View north west from western ridge of site



Plate D.5 View east from western ridge of site



Plate D.6 View north from western ridge of site



Plate D.7 View west from western ridge of site



Plate D.8 View northwest from western ridge of site



Plate D.9 View north from edge of Pendleton Brook, upslope along line of Roman Road

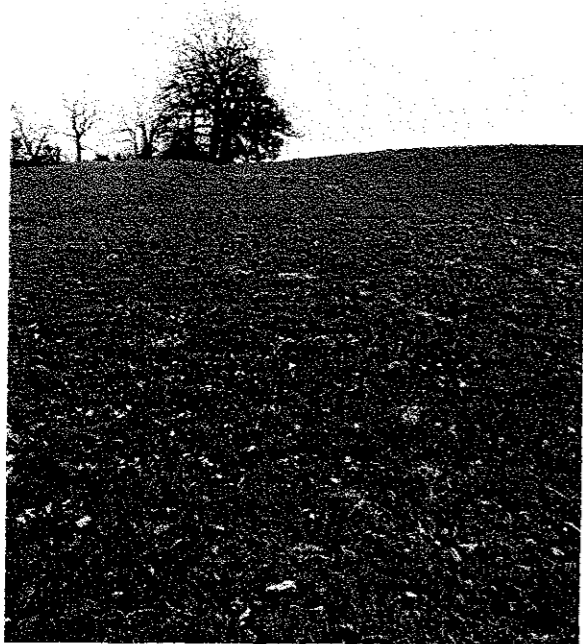


Plate D.10 View north from southeast corner of the site adjacent to Standen House grounds



Plate D.11 View east from southeast corner of the site adjacent to Standen House grounds



Plate D.12 View down to the Pendleton Brook as it exists the grounds of Standen House (under high arch bridge)



Plate D.13 View of Pendleton Brook (looking upstream)



Plate D.14 View of Pendleton Brook (looking upstream)



Plate D.15 View of Pendleton Brook (looking downstream)



Plate D.16 View of Pendleton Brook (looking upstream, on-site tributary is at left)



Plate D.17 View of Pendleton Brook (looking downstream)



Plate D.18 View of Pendleton Brook (looking downstream)



Plate D.19 View of Pendleton Brook (looking downstream) – not former flow control structure at upstream end of depot



Plate D.20 View of ditch at start of on site watercourse



Plate D.21 View of ditch (upper on site watercourse) – looking downstream



Plate D.22 View of ditch (upper on site watercourse) – end – assumed piped under properties?



Plate D.23 View of ditch (upper on site watercourse)



Plate D.24 View of ditch (upper on site watercourse)



Plate D.25 View of ditch confluence, looking west (ditch from plates D.20 to D.24 comes from right, ditch in plate D.26 from bottomed left)



Plate D.26 View of other upper ditch (tributary to on site watercourse)



Plate D.27 View of on-site watercourse



Plate D.28 View of on-site watercourse (under trees to left)



Plate D.29 View of on-site watercourse (water present, plus bed indicative of regular flows)



Plate D.30 View of on-site watercourse (boundary where watercourse flows along edge of recreation ground)



Plate D.31 View of on-site watercourse (site to left of hedge - boundary where watercourse flows along edge of recreation ground)



Plate D.32 View of on-site watercourse (site to back of photo, flow to the right, recreation ground behind)



Plate D.33 View of on site watercourse (behind hedge on right) - note spring area in centre of shot - flow towards centre of picture. Watercourse crossing in D.34 can be seen in background



Plate D.34 View of on-site downstream (south) from watercourse track crossing



Plate D.35 View of on-site watercourse downstream of crossing (view here is upstreamwards)



Plate D.36 View of on-site watercourse downstream-wards, start of 'ravine' feature



Plate D.37 View of on-site watercourse upstream of footbridge



Plate D.38 View of on-site watercourse downstream of footbridge



Plate D.39 View of spring emerging



Plate D.40 View of spring joining watercourse

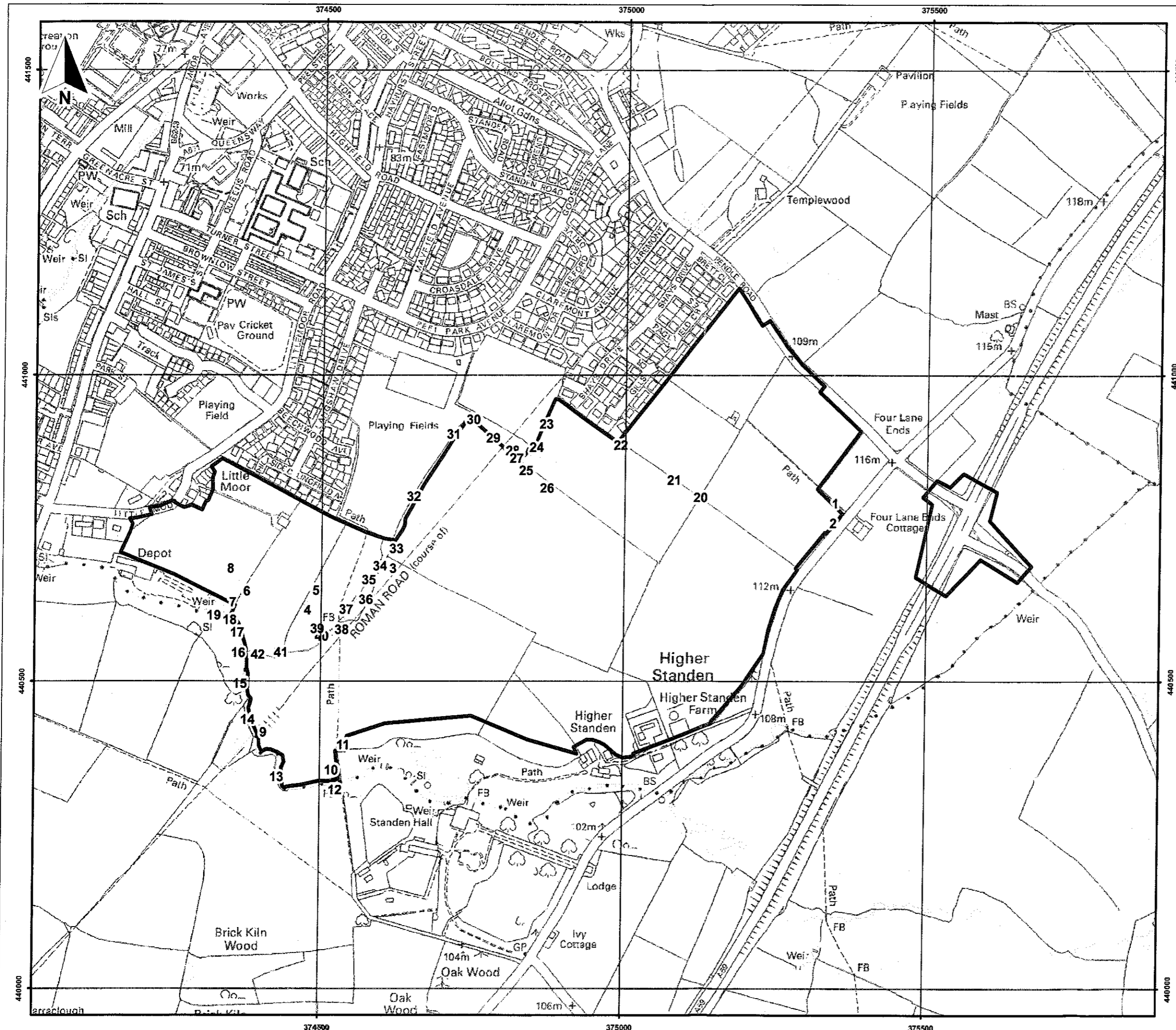


Plate D.41 View of lower portion of ravine with on-site watercourse



Plate D.42 View tributary confluence with Pendleton Brook (tributary flows towards centre from bottom right, Pendleton Brook flows left to right in the background)





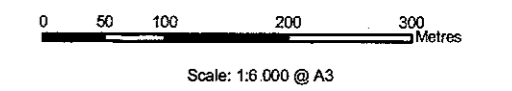
Key:

Site Application Boundary

33 Photo Location Reference

The main development site is the 50.1 ha plot in the west.

The four smaller areas to the east (14.3 ha total) comprise the total boundary of land, some of which will be used for the A59 junction improvements



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Trustees of Standen Estate
Land South of Clitheroe
Flood Risk Assessment

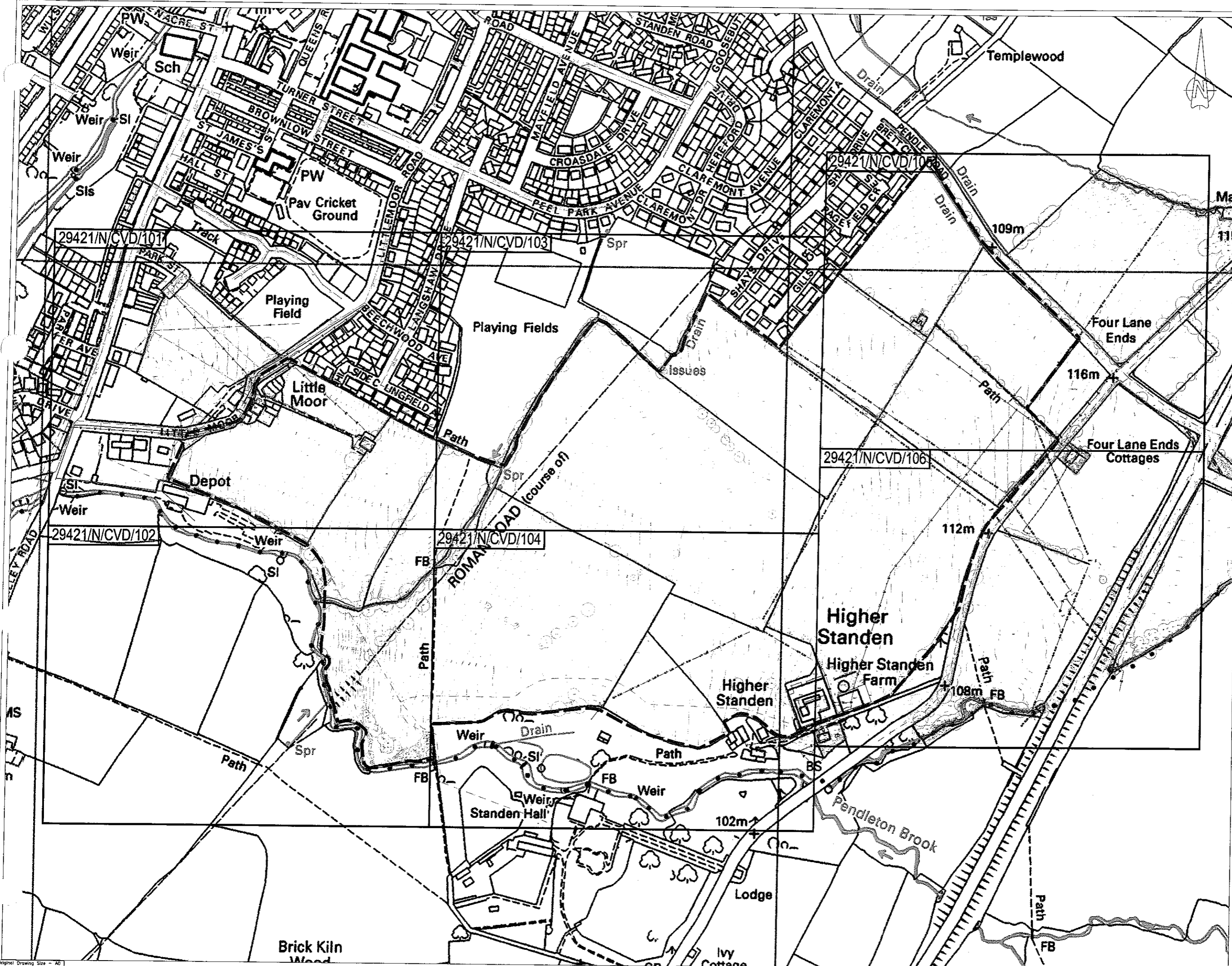
Figure D 1
Photo Locations

Based upon the Ordnance Survey Map with the permission of the Controller of Her Majesty's Stationery Office © Crown Copyright 100001776



Appendix E Service Plan

1 Page



DESCRIPTION				
REV	DATE	BY	CHK	APP
A				
DRAFT ISSUE				
REVISIONS				
REV	DATE	BY	CHK	APP

- NOTES:
- DO NOT SCALE FROM THIS DRAWING
 - ALL DIMENSIONS AND LEVELS IN METRES UNLESS NOTED OTHERWISE
 - TOPOGRAPHICAL SURVEY DATA OBTAINED FROM SURVEY OPERATIONS, DATED JULY 2011.
 - ALL SERVICES SHOWN ARE INDICATIVE ONLY. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONFIRM LOCATIONS BEFORE ANY WORK IS UNDERTAKEN.
 - THE SERVICES INFORMATION OBTAINED FROM THE STATUTORY SERVICE PROVIDERS HAS NOT BEEN VALIDATED BY AMEC. FUTURE USERS OF THIS PLAN MUST ENSURE THAT THE ACCURACY OF THE INFORMATION IS CHECKED & PROVEN.

- LEGEND:
- HIGHER STANDEN SITE BOUNDARY
 - - - EXISTING UNDERGROUND BT
 - - - EXISTING OVERHEAD BT
 - - - EXISTING UNDERGROUND TELEPHONE
 - - - EXISTING GAS PIPE
 - - - EXISTING UNDERGROUND ELECTRIC
 - - - EXISTING OVERHEAD ELECTRIC
 - - - EXISTING WATER SUPPLY
 - - - EXISTING SURFACE WATER SEWER
 - - - EXISTING FOUL WATER SEWER
 - - - EXISTING COMBINED WATER SEWER

DRAFT

SCALE: NOT TO SCALE

PROJECT TITLE:
PROPOSED DEVELOPMENT AT
STANDEN ESTATE CLUTHEROE

DRAWING TITLE:
APPROXIMATE LOCATION OF
EXISTING SERVICES

CLIENT:
TRUSTEES OF STANDEN ESTATES

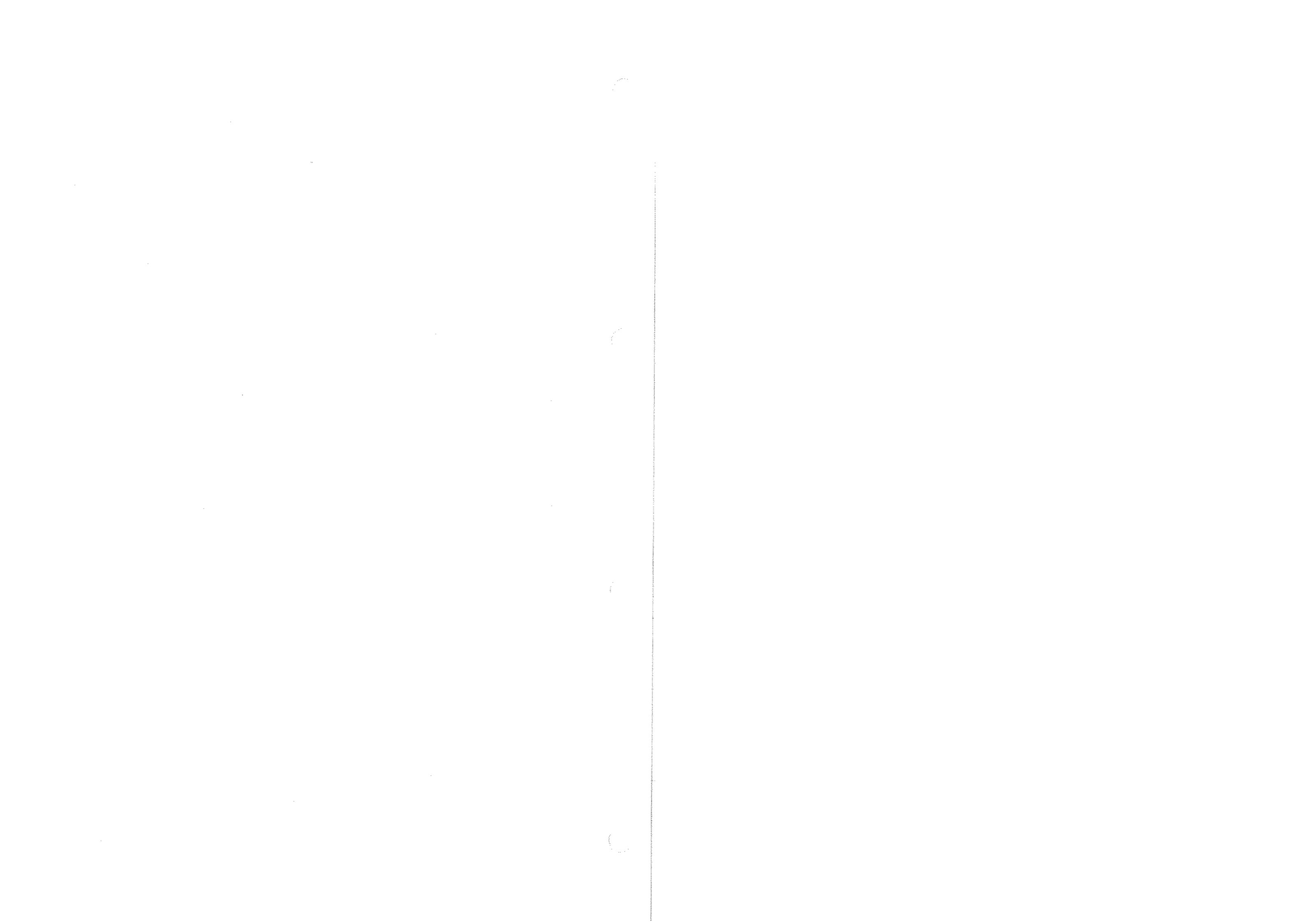
amec
WORSOR HOUSE, GARDROCK BUSINESS CENTRE
GARDROCK ROAD, WORSWORTH CV9 7JN
TEL: (01604) 344000 FAX: (01604) 344010

DRAWING No.
29421/N/CVD/100/A

Appendix F

Runoff Storage Calculations

6 Pages



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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.102	0.102	30.9	0.0	30.9	3579.0	Flood Risk
30 min Summer	0.124	0.124	39.4	0.0	39.4	4331.1	Flood Risk
60 min Summer	0.149	0.149	50.0	0.0	50.0	5219.0	Flood Risk
120 min Summer	0.178	0.178	62.6	0.0	62.6	6234.7	Flood Risk
180 min Summer	0.196	0.196	70.6	0.0	70.6	6866.2	Flood Risk
240 min Summer	0.209	0.209	76.3	0.0	76.3	7312.7	Flood Risk
360 min Summer	0.226	0.226	84.1	0.0	84.1	7903.7	Flood Risk
480 min Summer	0.236	0.236	88.9	0.0	88.9	8261.3	Flood Risk
600 min Summer	0.242	0.242	91.7	0.0	91.7	8478.7	Flood Risk
720 min Summer	0.247	0.247	93.9	0.0	93.9	8631.4	Flood Risk
960 min Summer	0.253	0.253	96.7	0.0	96.7	8840.1	Flood Risk
1440 min Summer	0.260	0.260	100.0	0.0	100.0	9097.8	Flood Risk
2160 min Summer	0.264	0.264	101.9	0.0	101.9	9228.8	Flood Risk
2880 min Summer	0.263	0.263	101.4	0.0	101.4	9202.3	Flood Risk
4320 min Summer	0.259	0.259	99.5	0.0	99.5	9063.3	Flood Risk
5760 min Summer	0.251	0.251	96.0	0.0	96.0	8797.4	Flood Risk
7200 min Summer	0.243	0.243	92.0	0.0	92.0	8502.5	Flood Risk
8640 min Summer	0.235	0.235	88.2	0.0	88.2	8208.0	Flood Risk
10080 min Summer	0.226	0.226	84.3	0.0	84.3	7926.4	Flood Risk
15 min Winter	0.115	0.115	35.8	0.0	35.8	4008.1	Flood Risk
30 min Winter	0.139	0.139	45.6	0.0	45.6	4850.4	Flood Risk
60 min Winter	0.167	0.167	57.7	0.0	57.7	5845.5	Flood Risk
120 min Winter	0.200	0.200	72.2	0.0	72.2	6984.4	Flood Risk

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	161.283	0.0	30
30 min Summer	97.982	0.0	45
60 min Summer	59.526	0.0	74
120 min Summer	36.163	0.0	132
180 min Summer	27.018	0.0	190
240 min Summer	21.970	0.0	248
360 min Summer	16.414	0.0	366
480 min Summer	13.347	0.0	482
600 min Summer	11.368	0.0	600
720 min Summer	9.972	0.0	642
960 min Summer	8.067	0.0	758
1440 min Summer	5.983	0.0	1010
2160 min Summer	4.437	0.0	1416
2880 min Summer	3.590	0.0	1824
4320 min Summer	2.699	0.0	2640
5760 min Summer	2.205	0.0	3408
7200 min Summer	1.885	0.0	4184
8640 min Summer	1.658	0.0	4936
10080 min Summer	1.488	0.0	5664
15 min Winter	161.283	0.0	30
30 min Winter	97.982	0.0	44
60 min Winter	59.526	0.0	72
120 min Winter	36.163	0.0	128

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


Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	0.220	0.220	81.3	0.0	81.3	7694.2	Flood Risk
240 min Winter	0.234	0.234	88.0	0.0	88.0	8196.7	Flood Risk
360 min Winter	0.253	0.253	96.9	0.0	96.9	8865.0	Flood Risk
480 min Winter	0.265	0.265	102.6	0.0	102.6	9275.1	Flood Risk
600 min Winter	0.272	0.272	105.9	0.0	105.9	9534.6	Flood Risk
720 min Winter	0.277	0.277	108.3	0.0	108.3	9698.3	Flood Risk
960 min Winter	0.282	0.282	110.7	0.0	110.7	9870.3	Flood Risk
1440 min Winter	0.288	0.288	113.3	0.0	113.3	10070.3	Flood Risk
2160 min Winter	0.287	0.287	112.9	0.0	112.9	10033.4	Flood Risk
2880 min Winter	0.281	0.281	110.0	0.0	110.0	9830.3	Flood Risk
4320 min Winter	0.269	0.269	104.3	0.0	104.3	9398.1	Flood Risk
5760 min Winter	0.254	0.254	97.4	0.0	97.4	8907.2	Flood Risk
7200 min Winter	0.241	0.241	91.3	0.0	91.3	8439.6	Flood Risk
8640 min Winter	0.229	0.229	85.5	0.0	85.5	8010.8	Flood Risk
10080 min Winter	0.218	0.218	80.4	0.0	80.4	7625.8	Flood Risk

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
180 min Winter	27.018	0.0	186
240 min Winter	21.970	0.0	244
360 min Winter	16.414	0.0	358
480 min Winter	13.347	0.0	470
600 min Winter	11.368	0.0	578
720 min Winter	9.972	0.0	680
960 min Winter	8.067	0.0	768
1440 min Winter	5.983	0.0	1070
2160 min Winter	4.437	0.0	1520
2880 min Winter	3.590	0.0	1960
4320 min Winter	2.699	0.0	2780
5760 min Winter	2.205	0.0	3592
7200 min Winter	1.885	0.0	4400
8640 min Winter	1.658	0.0	5184
10080 min Winter	1.488	0.0	5952

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.104	0.104	32.3	0.0	32.3	3679.5	Flood Risk
30 min Summer	0.125	0.125	41.0	0.0	41.0	4452.5	Flood Risk
60 min Summer	0.151	0.151	52.2	0.0	52.2	5364.5	Flood Risk
120 min Summer	0.180	0.180	65.1	0.0	65.1	6406.7	Flood Risk
180 min Summer	0.199	0.199	73.6	0.0	73.6	7053.6	Flood Risk
240 min Summer	0.212	0.212	79.7	0.0	79.7	7510.3	Flood Risk
360 min Summer	0.229	0.229	87.8	0.0	87.8	8113.0	Flood Risk
480 min Summer	0.239	0.239	92.5	0.0	92.5	8475.7	Flood Risk
600 min Summer	0.245	0.245	95.4	0.0	95.4	8694.4	Flood Risk
720 min Summer	0.249	0.249	97.6	0.0	97.6	8851.5	Flood Risk
960 min Summer	0.255	0.255	100.5	0.0	100.5	9064.5	Flood Risk
1440 min Summer	0.263	0.263	104.2	0.0	104.2	9325.7	Flood Risk
2160 min Summer	0.266	0.266	105.9	0.0	105.9	9453.8	Flood Risk
2880 min Summer	0.265	0.265	105.4	0.0	105.4	9420.4	Flood Risk
4320 min Summer	0.261	0.261	103.4	0.0	103.4	9267.3	Flood Risk
5760 min Summer	0.253	0.253	99.5	0.0	99.5	8989.3	Flood Risk
7200 min Summer	0.245	0.245	95.4	0.0	95.4	8682.4	Flood Risk
8640 min Summer	0.236	0.236	91.1	0.0	91.1	8377.9	Flood Risk
10080 min Summer	0.228	0.228	87.3	0.0	87.3	8089.0	Flood Risk
15 min Winter	0.116	0.116	37.3	0.0	37.3	4120.7	Flood Risk
30 min Winter	0.140	0.140	47.4	0.0	47.4	4986.3	Flood Risk
60 min Winter	0.169	0.169	60.2	0.0	60.2	6008.3	Flood Risk
120 min Winter	0.202	0.202	75.3	0.0	75.3	7177.2	Flood Risk

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	161.283	0.0	30
30 min Summer	97.982	0.0	45
60 min Summer	59.526	0.0	74
120 min Summer	36.163	0.0	132
180 min Summer	27.018	0.0	190
240 min Summer	21.970	0.0	248
360 min Summer	16.414	0.0	366
480 min Summer	13.347	0.0	482
600 min Summer	11.368	0.0	596
720 min Summer	9.972	0.0	636
960 min Summer	8.067	0.0	754
1440 min Summer	5.983	0.0	1008
2160 min Summer	4.437	0.0	1416
2880 min Summer	3.590	0.0	1824
4320 min Summer	2.699	0.0	2636
5760 min Summer	2.205	0.0	3408
7200 min Summer	1.885	0.0	4184
8640 min Summer	1.658	0.0	4936
10080 min Summer	1.488	0.0	5664
15 min Winter	161.283	0.0	30
30 min Winter	97.982	0.0	44
60 min Winter	59.526	0.0	72
120 min Winter	36.163	0.0	130

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Micro Drainage	Source Control W.12.6.1	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	0.223	0.223	84.9	0.0	84.9	7904.5	Flood Risk
240 min Winter	0.237	0.237	91.8	0.0	91.8	8418.5	Flood Risk
360 min Winter	0.256	0.256	101.0	0.0	101.0	9100.0	Flood Risk
480 min Winter	0.268	0.268	106.9	0.0	106.9	9516.0	Flood Risk
600 min Winter	0.275	0.275	110.3	0.0	110.3	9778.0	Flood Risk
720 min Winter	0.280	0.280	112.7	0.0	112.7	9941.7	Flood Risk
960 min Winter	0.285	0.285	115.2	0.0	115.2	10119.5	Flood Risk
1440 min Winter	0.291	0.291	117.9	0.0	117.9	10317.4	Flood Risk
2160 min Winter	0.289	0.289	117.2	0.0	117.2	10269.0	Flood Risk
2880 min Winter	0.283	0.283	114.2	0.0	114.2	10052.9	Flood Risk
4320 min Winter	0.270	0.270	107.8	0.0	107.8	9599.4	Flood Risk
5760 min Winter	0.256	0.256	101.0	0.0	101.0	9090.2	Flood Risk
7200 min Winter	0.242	0.242	94.2	0.0	94.2	8606.0	Flood Risk
8640 min Winter	0.230	0.230	88.2	0.0	88.2	8164.3	Flood Risk
10080 min Winter	0.219	0.219	83.0	0.0	83.0	7769.5	Flood Risk

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
180 min Winter	27.018	0.0	186
240 min Winter	21.970	0.0	244
360 min Winter	16.414	0.0	358
480 min Winter	13.347	0.0	470
600 min Winter	11.368	0.0	578
720 min Winter	9.972	0.0	680
960 min Winter	8.067	0.0	766
1440 min Winter	5.983	0.0	1068
2160 min Winter	4.437	0.0	1520
2880 min Winter	3.590	0.0	1956
4320 min Winter	2.699	0.0	2780
5760 min Winter	2.205	0.0	3584
7200 min Winter	1.885	0.0	4400
8640 min Winter	1.658	0.0	5184
10080 min Winter	1.488	0.0	5952

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.107	0.107	21.0	0.0	21.0	2237.4	Flood Risk
30 min Summer	0.129	0.129	26.5	0.0	26.5	2706.8	Flood Risk
60 min Summer	0.155	0.155	33.5	0.0	33.5	3259.5	Flood Risk
120 min Summer	0.185	0.185	41.7	0.0	41.7	3888.2	Flood Risk
180 min Summer	0.204	0.204	46.9	0.0	46.9	4276.7	Flood Risk
240 min Summer	0.217	0.217	50.5	0.0	50.5	4549.5	Flood Risk
360 min Summer	0.234	0.234	55.3	0.0	55.3	4906.1	Flood Risk
480 min Summer	0.244	0.244	58.2	0.0	58.2	5117.0	Flood Risk
600 min Summer	0.250	0.250	59.9	0.0	59.9	5241.8	Flood Risk
720 min Summer	0.254	0.254	61.2	0.0	61.2	5338.0	Flood Risk
960 min Summer	0.260	0.260	62.9	0.0	62.9	5464.2	Flood Risk
1440 min Summer	0.267	0.267	64.9	0.0	64.9	5615.2	Flood Risk
2160 min Summer	0.270	0.270	65.8	0.0	65.8	5680.0	Flood Risk
2880 min Summer	0.269	0.269	65.3	0.0	65.3	5647.9	Flood Risk
4320 min Summer	0.264	0.264	63.9	0.0	63.9	5536.0	Flood Risk
5760 min Summer	0.255	0.255	61.3	0.0	61.3	5354.9	Flood Risk
7200 min Summer	0.246	0.246	58.8	0.0	58.8	5158.8	Flood Risk
8640 min Summer	0.237	0.237	56.2	0.0	56.2	4968.6	Flood Risk
10080 min Summer	0.228	0.228	53.8	0.0	53.8	4789.6	Flood Risk
15 min Winter	0.119	0.119	24.1	0.0	24.1	2505.3	Flood Risk
30 min Winter	0.144	0.144	30.6	0.0	30.6	3031.3	Flood Risk
60 min Winter	0.174	0.174	38.5	0.0	38.5	3650.4	Flood Risk
120 min Winter	0.207	0.207	47.8	0.0	47.8	4356.7	Flood Risk

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	161.283	0.0	27
30 min Summer	97.982	0.0	41
60 min Summer	59.526	0.0	70
120 min Summer	36.163	0.0	128
180 min Summer	27.018	0.0	188
240 min Summer	21.970	0.0	246
360 min Summer	16.414	0.0	364
480 min Summer	13.347	0.0	482
600 min Summer	11.368	0.0	582
720 min Summer	9.972	0.0	624
960 min Summer	8.067	0.0	744
1440 min Summer	5.983	0.0	1000
2160 min Summer	4.437	0.0	1408
2880 min Summer	3.590	0.0	1820
4320 min Summer	2.699	0.0	2604
5760 min Summer	2.205	0.0	3408
7200 min Summer	1.885	0.0	4184
8640 min Summer	1.658	0.0	4928
10080 min Summer	1.488	0.0	5656
15 min Winter	161.283	0.0	27
30 min Winter	97.982	0.0	41
60 min Winter	59.526	0.0	70
120 min Winter	36.163	0.0	126

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Doherty Innovation Ce... Pentlands Science Park Edinburgh EH26 0PZ		Micro Drainage.
Date 04/10/2012 14:15	Designed by neill.malone	
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Micro Drainage	Source Control W.12.6.1	

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Overflow (l/s)	Max E (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	0.228	0.228	53.8	0.0	53.8	4793.3	Flood Risk	
240 min Winter	0.243	0.243	57.9	0.0	57.9	5100.5	Flood Risk	
360 min Winter	0.262	0.262	63.5	0.0	63.5	5504.8	Flood Risk	
480 min Winter	0.274	0.274	66.8	0.0	66.8	5748.8	Flood Risk	
600 min Winter	0.281	0.281	68.8	0.0	68.8	5900.4	Flood Risk	
720 min Winter	0.285	0.285	70.1	0.0	70.1	5993.8	Flood Risk	
960 min Winter	0.291	0.291	71.7	0.0	71.7	6101.7	Flood Risk	
1440 min Winter	0.296	0.296	73.1	0.0	73.1	6208.3	Flood Risk	
2160 min Winter	0.293	0.293	72.4	0.0	72.4	6162.0	Flood Risk	
2880 min Winter	0.287	0.287	70.5	0.0	70.5	6017.3	Flood Risk	
4320 min Winter	0.272	0.272	66.4	0.0	66.4	5722.0	Flood Risk	
5760 min Winter	0.257	0.257	62.0	0.0	62.0	5399.3	Flood Risk	
7200 min Winter	0.243	0.243	57.9	0.0	57.9	5095.9	Flood Risk	
8640 min Winter	0.230	0.230	54.2	0.0	54.2	4822.1	Flood Risk	
10080 min Winter	0.218	0.218	50.9	0.0	50.9	4578.8	Flood Risk	

Storm Event	Rain (mm/hr)	Overflow Volume (m³)	Time-Peak (mins)
180 min Winter	27.018	0.0	184
240 min Winter	21.970	0.0	242
360 min Winter	16.414	0.0	356
480 min Winter	13.347	0.0	468
600 min Winter	11.368	0.0	574
720 min Winter	9.972	0.0	674
960 min Winter	8.067	0.0	760
1440 min Winter	5.983	0.0	1062
2160 min Winter	4.437	0.0	1516
2880 min Winter	3.590	0.0	1940
4320 min Winter	2.699	0.0	2772
5760 min Winter	2.205	0.0	3576
7200 min Winter	1.885	0.0	4392
8640 min Winter	1.658	0.0	5120
10080 min Winter	1.488	0.0	5944