Burnley Strategic Flood Risk Assessment Level 1:

March 2017

Burnley Borough Council:

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1. Introduction

1.1 The Council is required under the National Planning Policy Framework (NPPF) 2012 to produce a Strategic Flood Risk Assessment (SFRA). The purpose of the SFRA is to identify and assess flood risk from all sources taking into account the effects of climate change. This information is then used to inform the Council's emerging Local Plan and, in line with Government objectives in the NPPF, direct development to areas of least risk and to ensure that development itself does not increase flood risk elsewhere.

1.2 In identifying and planning for flood risk and in compiling SFRAs local authorities are required to work closely with the Environment Agency (for coastal and 'main river' flooding) utilities (sewer flooding and some reservoirs) and other relevant bodies responsible for the management of water resources and of flood risk. Under and the Flood and Water Management Act 2010 Lancashire County Council is the Lead Local Flood Authority (LLFA) covering Burnley borough with responsibility for assessing and addressing the risks of flooding from 'local' sources. These include 'ordinary watercourses' (small streams and channels), surface water run-off and groundwater.

2. Scope and Purpose of the Report

2.1 The Burnley SFRA is in two parts. The Level 1 assessment will provide a strategic, borough wide overview of flood risk (from all sources). The primary purpose of the assessment is to form the basis for application of the sequential approach (through the Sequential Test- see Appendix 8) on the location of future development. The SFRA also assists in assessing potential impact on flooding related sustainability objectives.

2.2 This Level 1 SFRA updates and supersedes the Council's previous Level 1 SFRA published in 2009.

2.3 The Level 2 assessment will deal with any proposed Local Plan development sites which, following the application of the Sequential Test in Level 1, are found to be within areas of flood risk and suitable alternative lower risk sites are not available. In such cases the Exception Test (see Appendix 8) may also need to be applied or a more detailed technical analysis of site specific risk undertaken.

2.4 As a whole the SFRA will form an important part of the evidence base for emerging Burnley Local Plan.

3. Level 1 Assessment

Scope of the Assessment

3.1 Specifically the Level 1 SFRA will:

- Identify the river network within the Borough, including main rivers and ordinary watercourses and their flood zones (see plan Appendix 1)
- Identify within Flood Zone 3 (high risk), areas within the Borough to be designated 'functional floodplain' (Flood Zone 3b) where only water compatible and (exceptionally) essential infrastructure will be permitted in accordance with National Planning Practice Guidance for Flood Risk and Coastal Change (Para 015)
- Identify areas at risk of flooding from sources other than rivers including sewer flooding, groundwater and surface water

- Identify the location of any flood risk management measures including both infrastructure and the coverage of flood warning systems
- Identify locations where additional development may significantly increase flood risk elsewhere
- Provide guidance on the preparation of site specific Flood Risk Assessments in particular locations including those at risk from sources other than river flooding
- Set out the screening results of the potential development sites considered for allocation on the Local Plan
- Set out the results of the Sequential Test (see Appendix 8) used to support the local plan

Review of the SFRA

3.2 The SFRA will be updated as necessary as part of the review process for the Local Plan and its supporting evidence base in order to reflect any significant additions or revisions to the flood risk evidence e.g. major flood events, changes to flood zone boundaries arising from revised models, or revised climate forecasts. Methodology/information sources.

3.3 Principal information sources used in this Level 1 assessment are:

- Environment Agency maps showing Flood Zones (Flood Map for Planning (Rivers and Sea)) (Nov 2016)
- Environment Agency mapping relating to surface water flooding: Risk of Flooding from Surface Water (May 2016)
- Environment Agency detailed river network (June 2013), flood defence and flood storage data (Nov 2016)
- River Ribble Catchment Flood Management Plan December 2009 (Environment Agency NW)
- Lancashire and Blackpool Flood Risk Management Strategy (Lancashire County Council) and recorded local flooding incidents from the County Council as Lead Local Flood Authority (LLFA)
- Burnley, Nelson and Colne Flood Risk Management Strategy 2010 (Environment Agency NW)
- Information supplied by United Utilities (relating to sewer flooding and water infrastructure) and Canal and Rivers Trust (relating to Leeds & Liverpool Canal)
- Relevant information from other Council departments (e.g. details of culverted watercourses from the Council's Drainage Engineers

3.4 A more detailed list of references is at Appendix 10.

3.5 The comments of the Environment Agency on and LLFA the final content of the SFRA are awaited.

Policy Context

3.6 An overview of relevant policy context is at Appendix 11.

Overview of Burnley Borough

3.7 The borough of Burnley is located in the Pennines of East Lancashire at the confluence of the River Calder and the River Brun. The development of textile mills, associated industries and housing during the Industrial Revolution resulted in Burnley's population virtually doubling every twenty years

between 1801 and 1891. The character of the central parts of the two main settlements in the borough, Burnley and Padiham, derives from this time. The Leeds & Liverpool Canal runs through the borough and was one of the reasons for the town's expansion in the nineteenth century.

3.8 The area of the whole borough is 11,070 hectares (42 square miles), the majority of this being rural or moorland. The urban area of Burnley itself covers approximately 1,544 hectares (6 square miles) and Padiham covers 316 hectares (1.22 square miles)

Social and Economic Context

3.9 Following the 2011 Census the population of the borough was estimated to be 87,000 (ONS). Between 1991 and 2011, Burnley's population fell by 4.5% in stark contrast to a 12.7% rise in England as a whole. The latest population projections (SNPP 2012 based ONS released in 2014) to the end of the proposed new Local Plan period (2032) show a further small decline of 242 people or 0.28% from 2012. In the 2015 Index of Multiple Deprivation (IMD) Burnley was ranked the 9th most deprived area out of 326 local authority areas in England (based on rank of average scores). The most prevalent form of deprivation in the borough relates to health.

3.10 The level of future development throughout the Borough as a whole is currently guided by the saved Burnley Local Plan Second Review adopted in 2006 until the adoption of the new Burnley Local Plan scheduled for March 2018. The new Burnley Local Plan which has reached Proposed Submission stage, will allocate land to accommodate significant housing and employment growth within the Borough over the plan period in line with Council's ambitions and objectives. This will include a number significant greenfield sites outside the urban boundary defined in the current plan.

The Ribble Catchment

3.11 Burnley falls within the River Ribble catchment which drains an area of 1,490km² in North Yorkshire/Lancashire and covers a distance of around 110km from its source in the Yorkshire Dales to its mouth at the Ribble estuary between Preston and Blackpool. The River Calder, the Borough's principal river, is one of the Ribble's main tributaries. The catchment and the Environment Agency's plans for managing the various levels of flood risk within it, are discussed in further detail in section 4 below.

Landscape and Geology

3.12 Burnley's industrial foothills and valleys are characterised by a more gentle landform and more varied vegetation than the nearby higher ground of the South Pennine moorland plateaux. Key characteristics of the latter are exposed gritstone moors entrenched with narrow valleys and cloughs, lower level mixed moorland and blanket bog with sweeping landform and valuable wildlife habitats. This area is an important water catchment area and includes numerous reservoirs commonly surrounded by coniferous plantations. The upland landscape is cut by faults and deeply trenched glacial erosion features such as Cliviger Gorge. Agricultural land values are higher in the lower valleys.

3.13 Millstone grits form an almost complete circle around Burnley and make up the hills which surround the town. A major topographical feature, the Burnley syncline (downfold), part of The Lower Coal Measures series, outcrops over almost the entire area of the Borough. Drift cover over the Carboniferous series is absent on higher ground to the south and east of the Borough. Where present, drift cover is mainly glacial boulder clay of low permeability. Peat occurs as relatively extensive deposits on the Moors along the southern and eastern boundaries of the Borough. More permeable deposits, which can act as 'minor aquifers' are the alluvium and terrace deposits along the River

Calder and its tributaries and a small number of glacial sand and gravel exposures. (Sheets 68 (Clitheroe) and 76 (Rochdale) of the OS Geological Map series).

Green Infrastructure

3.14 The network of open spaces, waterways, gardens, parks, woodlands, green corridors, street trees and open countryside within and around our urban areas forms their 'green infrastructure', which provides multiple benefits including those which contribute to mitigation of and adaptation to climate change and a reduction in flood risk such as surface water management through natural drainage, local cooling (countering the 'heat island' effect of urban areas) and the provision of flood storage services.

3.15 The urban core of Burnley borough is generally well provided with greenspace, particularly parks and gardens, semi-natural greenspace and amenity greenspace. Four of Burnley's five Historic Parks and Gardens are situated on or adjacent to floodplains.

3.16 Further details of the borough's green infrastructure and its role in managing water resources and alleviating flood risk are available in the Burnley Green Infrastructure Strategy (TEP consultants 2013).

4. Flood Risk from Main Rivers

Watercourses

4.1 The urban settlements of Burnley form a continuous linear development along the length of its rivers, reflecting the importance of the rivers to the development of the textile manufacture industries that were characteristic of this part of East Lancashire.

4.2 Watercourses are divided into two categories: main rivers (including the Calder, Brun, Don, Green Brook and Pendle Water in Burnley) and ordinary watercourses (OW). The Environment Agency has permissive powers to undertake flood defence works on main rivers and local authorities have similar powers/responsibilities in relation to ordinary watercourses. Ultimately, however, it is the riparian landowners' responsibility to maintain watercourses. Under the Flood and Water Management Act 2010 Lancashire County Council as Lead Local Flood Authority has additional powers to administer consents for private changes to ordinary watercourses.

Culverted Watercourses

4.3 A culvert is a covered structure under a road, embankment etc, to direct the flow of water. The Water Resources Act 1991 defines a watercourse as any river, stream, ditch, drain, cut, culvert, dyke, sluice, sewer and passage through which water flows, except a public sewer.

4.4 Particularly within the borough's urban boundary many of Burnley's watercourses, both main rivers and ordinary watercourses, have been built over and culverted to some extent. Depth of culverts may depend on local topography and the nature of the development which led to the watercourse being built over. Much surface water draining into the surface water system will eventually feed into culverted watercourses.

4.5 The Council's records show some culverted watercourses extend over large parts of the built up area and thus have extremely complex issues of ownership/responsibility. Burnley Borough Council only has responsibility for culverts on its own land. LCC is responsible for culverts below the public highway. Ownership issues can arise around definition of the highway boundary.

4.6 While the Council has no duty to manage culverts without its own land, it does have powers in relation to potential blockages, the implications of new development for culvert capacity on neighbouring land, and developments affecting the rate of release of water into culverts.

4.7 Further discussion of the flood risks associated with culverts is at section 6 below. The detailed River Network in the Burnley Borough is shown on the plan at Appendix 1.

Environment Agency Flood Zones

4.8 The Environment Agency's Flood Map for Planning (Rivers and Sea) identifies those areas within the Borough which are at risk from fluvial flooding (but not other types of flooding). These zones following the routes of the Borough's principal watercourses are shown on the plan at Appendix 1.

4.9 Land in Flood Zone 1 is of low risk (less than 0.1%). Land in Flood Zone 2 is of low to medium risk (0.1 – 1.0%) and land in Zone 3 has high risk of flooding (1.0% or greater). 1% risk means a 1 in 100 chance of being equalled or exceeded in any given year.

4.10 Further detail of Flood Zones including the types of development which are compatible and the requirements for Flood Risk Assessments to accompany development applications, is at Appendix 6 and 7.

Table 1: Environment Agency Flood Zones

Flood Zone	Annual Probability of flooding
Flood Zone 1	<1 in 1,000 (<0.1%)
Flood Zone 2	Between 1 in 1,000 (0.1%) and 1 in 100 (1%) for river flooding, 1 in 200 (0.5%) for flooding from the sea
Flood Zone 3a	>1 in 100 (>1%) for river flooding and >1 in 200 (0.5%) for flooding from the sea
Flood Zone 3b	Functional floodplain (see definition below)
Source: National Planning Practice Guidance Flood Risk and Coastal Change Para 065 Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the Strategic Flood Risk Assessment when considering location and potential future flood risks to developments and land uses.	

The Functional Floodplain

4.11 NPPG defines functional floodplain (Zone 3b) as land where water has to flow or be stored in times of flood (Table 1 Flood Zones para 065). Local planning authorities should identify areas of functional floodplain in their SFRAs in discussion with the Environment Agency and the Lead Local Flood Authority. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood (such as a flood attenuation scheme) in an extreme (0.1%) flood should provide a starting point for consideration. The area identified as functional floodplain should take into account the effects of defences and other flood risk management infrastructure. Areas which would naturally flood, but which are prevented from doing so by existing infrastructure or solid buildings, will not normally be defined as functional floodplain. If an area is intended to flood e.g. an upstream flood storage area designed to protect communities further downstream, then this should be safeguarded from development and identified as functional floodplain, even though it might not flood very often (NPPG Para 015).

4.12 Only water compatible and essential infrastructure uses as set out in NPPG Table 1 Flood Zones para 065 should be permitted in this zone. Essential infrastructure in this zone should pass the Exception Test.

4.13 In the previous (2009) Burnley SFRA all undeveloped areas within Flood Zone 3 were identified as functional floodplain as a starting point for consideration following Environment Agency advice. This included all greenfield land including large urban green spaces. In updating the SFRA the Council in line with NPPG Para 015 commissioned JBA consultants to refine this delineation using:

- Updated Nov 2016 Flood Zone 3 outline
- All available 1 in 20/1 in 25 models for main rivers within the borough

4.14 Where 1 in 20/1 in 25 models were not available, the 2009 outline (updated to 2016) is used. A plan of the updated functional floodplain outline is at Appendix 1. Further details of JBA's methodology for establishing functional floodplain is at Appendix 4.

Historic flooding

4.15 There is a long history of flooding within Burnley which has resulted in property damage and risk to life. Mostly recently in December 2015 unprecedented rainfall events across Lancashire led to flooding in 9 Burnley communities varying in extent from 1 to 147 properties affected by internal flooding. Communities affected were:

- Brunshaw – 3 properties
- Clowbridge – 5 properties
- Ightenhill – 1 property
- Rose Hill – 1 property
- Burnley Town Centre – 6 properties
- Heasandford – 1 property
- Mereclough – 8 properties
- Padiham – 147 properties
- Worsthorne – 8 properties

4.16 In its role as Lead Local Flood Authority, Lancashire County Council identified the December 2015 floods as an event requiring investigation under the requirements of Section 19 of the Flood and Water Management Act 2010 for the purpose of identifying which flood risk management authorities had or still have relevant functions to be exercised in regard to these flood events. A preliminary report of the LLFA's findings was published in October 2016 and included a summary of the 2015 flood events in Burnley communities. This summary is reproduced at Appendix 12. A more detailed report of Recommended Actions for each District including Burnley was produced in November 2016. These included County, District and community actions. This report will be updated on a quarterly basis to allow affected communities to see progress and resolution of as many issues as possible as quickly as possible.

4.17 Lancashire County Council is responsible as LLFA for maintaining records of local flooding incidents arising from sources other than main rivers and for carrying out any necessary repair/maintenance/improvement works. Burnley Council's Streetscene section records and reports incidents to the County Council and works with them via regular 'Making Space for Water' Group meetings on implementing solutions to local flood hotspots. Details of the LLFA's current records between April 2013 (when the LLFA was established) and November 2015, has informed the SFRA. At the end of this period 45 local flood incidents within the borough had been actioned and archived, with three remaining 'live.'

5. Environment Agency Flood Risk Management Plans affecting Burnley

Ribble Catchment Flood Management Plan (RCFMP) (Full report January 2009, Summary Report December 2009

5.1 This is a long term strategic plan produced by the Environment Agency which sets the Agency's preferred plan working with a wide range of partners including local authorities for sustainable flood risk management at the catchment level for the next 50-100 years. It identifies flood risk and what affects it most. It considers flooding from all sources except tidal (addressed in Shoreline Management Plans) and scenarios for the effects of climate change, development and land management. It recommends 1 of 6 generic policies for identified policy units and provides an action plan for flood risk management activities. It does not look at issues on individual sites.

5.2 The RCFMP divides the Ribble Catchment into ten sub areas. Two of these 'Rural Calder and Darwen' and 'Calder Urban Areas' include parts of Burnley Borough.

Calder Urban Areas – parts of Burnley, Pendle and Blackburn local authority areas

5.3 This entirely urban area is at a high risk of flooding. This is due to a variety of factors; heavily culverted watercourses in the sub area, rapidly reacting upland catchment upstream and the flood risk posed by open rivers.

- Around 4,700 properties are at risk of flooding in the sub area which is forecast to rise to 8,200 over the next 1,000 years due to the effects of climate change.
- There are 8 schools and 7 health care facilities currently at risk in a 1% event with an extra 3 health care facilities at risk by 2100 due to climate change.
- Principal types of flooding are river flooding (in Burnley the Rivers Calder and Brun) and sewer flooding.
- The sub area contains seven areas where residents are offered a flood warning service, illustrating the high flood risk.

5.4 The EA characterize this area as one of "moderate to high flood risk where we can generally take further action to reduce flood risk" (Policy Option 5). Proposed actions to implement this policy option include:

- Implement the recommendations of our (EA) previous studies to reduce flood risk, by carrying out works such as the installation of defences or the opening up of culverts where it is economically justifiable.
- Local authorities to produce SFRAs to cover their areas, to help minimise flood risk to future development from all sources.
- Promote the application of rigorous planning control for any new developments in the sub-area and encourage the implementation of SUDS.
- Investigate the causes of surface water flooding and sewer flooding in the sub-area, defining the theoretical risk from these sources and carry out remedial actions.

5.5 Areas of high or very high social vulnerability that are located within the current 0.1% flood extent are found in Burnley and Padiham. Socially vulnerable groups can be found in urban Burnley who might find it difficult to recover from a major flooding incident.

Rural Calder and Darwen sub area

5.6 This large, predominantly rural sub-area has a generally low flood risk which will not rise significantly due to climate change. There are a few isolated flood risk problems in villages such as Trawden, Whalley and Higher Walton where some residents receive a flood warning service.

5.7 The rest of the sub-area is sparsely populated, with a small number of dispersed properties at risk of flooding. This number could increase due to climate change.

5.8 The EA characterize this area as one of "low to moderate flood risk where we are generally managing existing flood risk effectively" (Policy option 3). Actions to achieve these policy aims within Burnley are based on promoting land use/land management projects by landowners to benefit flood risk, via Higher Level Stewardship (HLS).

5.9 The South Pennine Moors is a site of international importance designated as a Special Area of Conservation (SAC) for its blanket bog and sessile Oak woods. Less than 1% of the area would be at risk from 1% or 0.1% flood events. South Pennine Moors Phase 2 Special Protection Area (SPA) (designated for its waders and upland birds) is likewise considered to be <1% at risk under both flood events. (RCFMP, Table 3-6, p89)

5.10 Increasing natural floodwater storage within the upper catchment, through grip blocking, may enhance sites such as South Pennine Moors. This could also reduce flooding and restore more natural flows within the river, reducing erosion and sediment inputs and benefiting fisheries.

5.11 The RRCFMP also identifies transport infrastructure at risk of flooding within Burnley.

Table 1: Transport Infrastructure at risk of flooding in Burnley

Type of transport	Route	River
Railway	Preston to Colne	Calder
Canal	Leeds Liverpool	Calder
Road	M65	Calder, Pendle Water
Road	A671/A678	Calder (Padiham)

5.12 Where motorways are on embankments, the road surface is not at direct risk of flooding from rivers. However, the embankments may be at risk and in some locations embankments can cause backing up of flood flows which may lead to flooding elsewhere. Where A-roads at risk from flooding, there are generally alternative routes although these are on minor roads and will lead to additional congestion and inconvenience.

5.13 The Leeds & Liverpool Canal is potentially affected by flooding and may cause flooding (from raised sections such as the Straight Mile in Burnley Town Centre).

Local authority and the CFMP

5.14 CFMP actions on which the Council will lead are:

- the application of rigorous planning control for any new development on floodplains and encouragement of the implementation of SuDS
- production of a Strategic Flood Risk Assessment

5.15 Other actions will involve the Council working in partnership with the EA and United Utilities. Progress in delivering the above actions is monitored through the Council's Annual (Authority)

Monitoring Report. Since 2011 Lancashire County Council reports to Government via new national indicator 080-00 'Flood and Coastal erosion risk management and sustainable drainage systems.'

Burnley, Nelson and Colne Draft Flood Risk Management Strategy (BNCFRMS) 2011

5.16 Within the 'Calder Urban Areas' sub area of the catchment, the Environment Agency has also produced a lower level Flood Risk Management Strategy for Burnley, Nelson and Colne which sets out specific measures to address flood risk relating to Burnley, Nelson, Padiham, Colne and Trawden over the next 100 years. 17 flood risk reaches (FRRs) are identified within the Strategy area. The table below provides details of those reaches within the Burnley Borough and preferred policy options. More detailed descriptions of the Burnley FRRs and policy options are at Appendix 5.

Table 2: Environment Agency Burnley Flood Risk reaches and protection

Flood Risk Reach	History of flooding	Current Standard of Protection	Condition of existing defences	Measures to manage probability	Measures to manage consequences of flooding
Fulledge, Burnley	Numerous records of flooding of the low lying areas of park and recreational land at this FRR. It is estimated that flooding occurs every two to three years on average	4%	No formal raised defences recorded in NFCDD	Routine inspections of the channel	Flood warning area is operational
Plumbe Street, Burnley	There are no specific references to this FRR in the history of flooding. However, there have been twenty recorded floods in the Burnley area since 1900 some of which may have affected Plumbe Street	1.33%	There are no formal raised defences recorded in NFCDD. There are some raised walls that will provide some flood protection.	Routine inspections of the channel	Flood warning area is operational
Burnley Central	There is no specific mention of this FRR in the flood history. However, there have been 20 recorded floods in the Burnley area since 1900. In 2008 high river levels and intense rainfall resulted in the retaining wall at the St Peter's Centre collapsing into the channel although no flooding is recorded as a result.	20%	There are no formal raised defences recorded in NFCDD. There are some raised walls that will provide some flood protection.	Routine inspections of the channel	Flood warning area is operational
Padiham	There are 3 flood events recorded in the flood history for this FRR in 1866, 1928, and 2000. In 2000 the Town Hall car park and areas of Lune Street were flooded. There was a near miss in 2008 with water levels in the Calder almost reaching the top of the arch of Burnley Road Bridge. However, the	10%	Riverside wall on boundary of Council offices in very poor condition. Erosion to embankment and varying flood defence levels at u/s end of Padiham.	Council did some minor flood alleviation works to close wall gaps in 2007. Routine inspections. Limited	Flood warning area is operational

	walls behind the Town Hall were not overtopped.			adhoc maintenance (approx every five years) of the channel	
Burnley East	There is 1 specific reference to this FRR in the flood history. This was an event in 1930 when Thompson Park was flooded. However, there are 20 recorded flood events in Burnley since 1900 some of which may have affected the area.	4%	The channel is very deep in most places and there are no formal raised defences	Routine inspections of channel and road culvert structures	There is no flood warning in place.
Green Brook Upper, Padiham	There are no recorded flooding events for this FRR	1.33%	No formal raised defences in this residential area	Routine inspections of channel and road culvert structures	There is no flood warning in place
Green Brook Lower, Padiham	1 flood event is recorded for this FRR in 2001. Roads and residential gardens were flooded.	20%	There are no formal raised defences. There is one long culvert and one road bridge prone to blockage	Routine inspections of channel and culvert structures. Maintenance is adhoc.	Flood warning area is operational

Source: Burnley Nelson and Colne Flood Risk Management Strategy March 2011

Table 3: Environment Agency Burnley Flood Risk reaches: Properties at risk

Flood risk reach	Flooding mechanism in current situation	Properties at risk in band shown (%AEP) Residential (non residential)			
		Very significant risk	Significant risk	Moderate risk	All risk bands
		>5%	<5%>1.3%	<1.3%>0.5%	Total at >0.5%
Fulledge	Overtopping	0 (0)	93 (1)	307 (32)	400 (33)
Plumbe Street	Overtopping	0 (0)	0 (1)	51 (24)	51 (25)
Burnley Central	Overtopping of walls at bridge	0 (14)	0 (17)	0 (52)	0 (83)
Padiham	Wall collapse and overtopping	0 (0)	9 (76)	0 (0)	19 (76)
Burnley East	Overtopping	0 (2)	3 (1)	2 (1)	5 (4)
Green Brook Upper	Overtopping and channel blockage	0 (0)	1 (0)	25 (0)	26 (0)
Green Brook Lower	Overtopping at bridge	35 (6)	19 (0)	7 (7)	61 (13)

Source: Burnley Nelson and Colne Flood Risk Management Strategy March 2011

Table 4: Summary of EA preferred management options by flood risk reach

Flood Risk Reach	Preferred Option	Adaptation with climate change
Fulledge	Raise defences to provide protection against a 1.33% SoP	Raise defences to maintain preferred option SoP
Plumbe Street	Do minimum with focussed enforcement to undertake repairs on canal culvert. Ensure flow through canal culvert is not increased. Enforce others to repair and rebuild 3rd party walls (that could pose a blockage risk)	Raise defences to increase SoP
Burnley Central	Enhanced maintenance (filling low spots in defence height) to provide protection against a 1% AEP. Enforce others to repair and rebuild 3rd party walls (that could pose a blockage risk)	Raise defences to maintain current SoP
Padiham	Raised defences to 1% AEP SoP when contributions become available. Enforce others to repair and rebuild 3rd party walls (that could pose a blockage risk). Through Development and Flood Risk adopt a planning led approach to improve SoP with new development. Request Council apply future infrastructure charge on new development to pay for FRM improvements.	Raise defences to maintain preferred option SoP
Burnley East	Do minimum with focussed planning led approach to improve SoP with new development. Enforce other to repair and rebuild 3rd party walls (that could pose a blockage)	Do minimum
Green Brook Upper	Do minimum with focussed planning led approach to improve SoP with new development. Removal of gravel and vegetation from channel (dependent on changes in channel cross-section). Enforce individual properties to maintain own boundary walls (to prevent collapse and blockage in channel)	Do minimum
Green Brook Lower	Enhanced maintenance to provide protection against at least 10% AEP. Flood resilience to individual properties. Enforce individual properties to maintain own boundary walls (to prevent collapse and blockage in channel). Provide local residents with targeted information about the risk of blockage and flooding associated with the build up of debris, vegetation and sediment in the channel. Agreement with Highway Authority to improve conveyance through bridge structures (in compliance with PPS25) when new works are planned.	Raised defences to 1.3% AEP SoP

Source: Burnley Nelson and Colne Flood Risk Management Strategy March 2011

6. Flood Risk Management

6.1 The aim of this section of the SFRA is to identify existing Flood Risk Management (FRM) assets and previous/proposed FRM schemes in the Borough. The location, condition and design standard of existing assets will have a significant impact on actual flood risk mechanisms; whilst future schemes in high flood risk areas carry the possibility of reducing the probability of flood events and reducing the overall level of risk. Both existing assets and future schemes will have a further impact on the type, form and location of new development or regeneration.

6.2 Flood risk management within the study area is provided predominantly in the form of river walls, some of which are walls of historical mill buildings, raised defences and natural floodplain storage. Historically, the provision of flood defences has been reactive in response to damage sustained and as such the level of protection they provide varies. The area now has a legacy of dependency on these defences, particularly in parts of the Calder in Padiham. In Burnley, retaining walls, weirs and culverts constrain parts of the River Calder at old mill sites.

6.3 If the Environment Agency owns a defence, it will maintain it but it only has permissive powers to maintain channels. Ultimately it is the riparian landowners' responsibility to maintain watercourses. It should not be assumed that the Agency will always maintain channels.

6.4 The EA provide a spatial defences dataset via the Government's Spatial Data Catalogue. The Flood Risk Management Plan at Appendix 1 includes this data and shows that there are major flood embankments located within the Borough. Each embankment is situated on Main River and therefore will be owned and maintained by the EA.

EA Assets

Table 5: EA flood embankments in Burnley

Asset ref	Asset	Type	Flood Source	Watercourse	Design Standard (1:n years. eg '100'=designed to protect from 1 in 100yr (1%) flood event)	Bank	Condition
10966	Private Flood Embankment to Service Pipe at Rear of Houses on Park Road	Embankment	Fluvial	River Calder	5	Left	4-Good
386234	Unity College Flood Storage Area	Embankment	Fluvial	River Calder	-	Right	3-Fair
10878	Footbridge at Recreation Ground to End of Fulledge Conservation Area	Wall	Fluvial	River Calder	75	Right	3-Fair
108939	Recreation Ground, Fulledge	Embankment	Fluvial	River Calder	40	Right	3-Fair
386233	Recreation Ground, Fulledge	Embankment	Fluvial	River Calder	200	Right	3-Fair
90065	Oxford Road to corner of Building	Wall	Fluvial	River Calder	100	Right	4-Good
71542	Hammerton Street	Wall	Fluvial	River Calder	100	Right	3-Fair

	to Culvert Outlet at Manchester Road						
92119	Playing Fields upstream of Home Farm to downstream of Hagg Wood	Embankment	Fluvial	River Calder	100	Right	3-Fair
66993	End of Works to Outfall downstream of Home Farm	Embankment	Fluvial	River Calder	40	Right	3-Fair
65051	Park Road to Padiham Bridge	Wall	Fluvial	River Calder	25	Right	2-Poor
125111	Upstream of A6068 to Electric Sub Station Footbridges	Embankment	Fluvial	River Calder	100	Left	3-Fair
65048	Start of Embankment downstream of A6068 to upstream of A6068	Embankment	Fluvial	River Calder	100	Left	4-Good

Fulledge Flood Storage Scheme

6.5 In August 2012 planning permission was granted for an Environment Agency scheme to provide flood protection to 150-200 residents in the Fulledge area of Burnley at risk of 1 in 100 yr (1%) flood event. The scheme involved the construction of an embankment along the edge of Fulledge Recreation Ground and also changes to existing flood storage arrangements at Unity College within Towneley Park.

Padiham Flood Risk Alleviation Scheme

6.6 There is a history of flood events in Padiham. These include 1866, 1928, 1964, 2000, 2008 and most recently in December 2015 when 147 properties were flooded including residential and commercial properties as well as critical infrastructure such as the fire station, medical centre and a hospice. Preliminary reports indicate that the primary cause of flooding was the River Calder which overtopped its banks, however, some properties were also affected by the River Green Brook.

6.7 A Padiham Flood Defence scheme is a high priority. In 2015 the EA completed an Initial Assessment Report on the River Calder at Padiham to assess the costs, benefits and partnership funding requirements of a fluvial flood alleviation scheme for Padiham. The study has assessed a number of options. The preferred option is for Raised Defences including raising existing flood walls and an embankment on land to the East of the former Baxi site. This scheme is identified in the Council's Infrastructure Delivery Plan (IDS) and funding has been secured through Growth Deal 3 and EA Grant in Aid. Funding is being sought through Growth Deal 3 and EA Grant in Aid scheme.

6.8 As well as the ownership and maintenance of a network of formal defence structures, the EA carries out a number of other flood risk management activities that help to reduce the probability of flooding, whilst also addressing the consequences of flooding. These include:

6.9 Maintaining and improving existing flood defences, structures and Main River.

6.10 Enforcement and maintenance where riparian owners unknowingly carry out work that may be detrimental to flood risk.

6.11 Identifying and promoting new flood alleviation schemes (FAS) where appropriate.

6.12 Working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is permitted relative to the scale of flood risk.

6.13 Operation of Floodline Warnings Direct and warning services for areas within designated Flood Warning Areas (FWA) or Flood Alert Areas (FAA). EA FWAs are shown on the SFRA Maps in Appendix 1.

6.14 Promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and are therefore sufficiently prepared in the event of flooding.

6.15 Promoting resilience and resistance measures for existing properties that are currently at flood risk, or may be in the future as a result of climate change.

6.16 There is a concentration of privately owned defences in Burnley (RCFMP p95) which are not included in the Agency's repairs and maintenance programmes. Many of the mills which they protect are vacant. A number of short walls exist at the confluence of the Calder and the Brun and downstream of Fulledge. Approximately 50% of defences are privately owned and are in poor and very poor condition with a 1 in 40 yrs standard of protection (overall condition grading of 3 & 4, worst condition grading of 5). This is a cause for concern and the defences will require structural work in the near future. There are no local authority maintained structures in Burnley.

LLFA Assets

6.17 Lancashire County Council as LLFA owns and maintains a number of assets throughout the Borough which includes culverts, bridge structures, gullies, weirs and trash screens. The majority of these assets lie along ordinary watercourses within smaller urban areas where watercourses may have been culverted or diverted, or within rural areas. All these assets can have flood risk management functions as well as an effect on flood risk if they become blocked or fail. In the majority of cases responsibility lies with the riparian/land owner.

6.18 As part of its FWMA duties, the LLFA has a duty to maintain a register of structures or features, which are considered to have a significant effect on flood risk, including details on ownership and condition as a minimum. The Asset Register should include those features relevant to flood risk management function including feature type, description of principal materials, location, measurements (height, length, width, diameter) and condition grade. The Act places no duty on the LLFA to maintain any third party features, only those for which the authority has responsibility as land/asset owner. A list of registered flood assets within Burnley and Lancashire can be viewed at:

Water Company Assets

6.19 There is a risk of localised flooding associated with the existing drainage capacity and sewer system. The drainage system may be under capacity and / or subject to blockages resulting in localised flooding of roads and property. United Utilities is responsible for the management of the urban drainage system. This includes surface water and foul sewerage. There may however be some private surface water sewers in the district as only those connected to the public sewer network transferred to the water companies under the Private Sewer Transfer in 2011. Surface water sewers discharging to watercourses did not transfer and would therefore not be under the ownership of United Utilities, unless adopted under a Section 104 adoption agreement.

6.20 Water company assets include Wastewater Treatment Works, Combined Sewer Overflows, pumping stations, detention tanks, sewer networks and manholes.

Flood Warning Areas

6.21 Flood warning does not reduce the probability of a flood event happening but can reduce its effects. The Environment Agency Flood Warning Investment Strategy shows that a timely flood warning where the recipient takes appropriate action can reduce the cost of damages by 30%. With current warning systems and readiness of recipients a reduction of 10% in economic damage is thought to be more realistic. The Environment Agency currently aims to provide a two hour lead time for any flood warning.

6.22 Formal flood warning areas exist where detailed flood forecasting, linked to a robust river level monitoring network, can provide reliable warnings to the public and businesses. Informal flood warning areas exist where a reliable warning to the public is not possible and warnings are only provided to Environment Agency partners including the local authority.

6.23 The following formal Flood Warning Areas have been established in Burnley Borough:

Table 6: Flood Warning Areas in Burnley Borough

Current Flood Warning Area Name	Number of properties in the Flood Warning Area
River Brun at Burnley, Area A	13
River Brun at Burnley, Area B	25
River Calder at Burnley Town Centre, Area A	13
River Calder at Burnley Town Centre, Area B	60
River Calder at Fulledge, Area A	25
River Calder at Fulledge, Area B	998
Green Brook and Sweet Clough at Padiham, Area A	34
Green Brook and Sweet Clough at Padiham, Area B	54
Green Brook and Sweet Clough at Padiham, Area C	138
River Calder at Padiham, Area A	74
River Calder at Padiham, Area B	168
River Calder at Padiham, Area C	4

6.24 Further detail of the flood risk in these areas is provided by relevant BNCFRMS Flood Risk Reach descriptions at Appendix 4. In all cases the outer extent of the flood warning areas is the extreme flood outline, therefore warnings will be provided up to the 1 in 1000 year return period flood.

7. Local Flood Risk

7.1 The Flood and Water Management Act 2010 established Lancashire County Council as lead local flood risk authority (LLFA)with responsibilities for assessing and addressing local flood risk in partnership with other local agencies including the Council. Local Flood Risk encompasses flooding from a number of sources including flooding from ordinary watercourses (i.e. not main rivers which are covered by the Environment Agency) surface water flooding, groundwater flooding. Since April 2015 the County Council as LLFA has been a statutory consultee in the planning process for major development proposals which have surface water implications.

Lancashire and Blackpool Flood Risk Management Strategy

7.2 As part of its role as LLFA, Lancashire County Council has worked in partnership with Blackpool Council to develop a joint Lancashire and Blackpool Local Flood Risk Management Strategy 2014-2017.

7.3 The strategy outlines the duties and responsibilities of flood risk agencies including emergency planning functions; assesses existing and future local flood risk in the county and sets out a Local Flood Risk Management Plan with short and medium term strategic objectives. In order to understand local flood risk in more detail, a number of studies were undertaken to support the Local Strategy.

7.4 In order to understand local flood risk in more detail, the County Council has undertaken a number of studies to support the Local Strategy. These studies are aimed at achieving a high level of understanding around the main areas of risk across the region so that risk monitoring, further studies and works to reduce flood risk can be prioritised.

Preliminary Flood Risk Assessment (PFRA)

7.5 This work, undertaken in response to the Flood Risk Regulations 2009, was completed by Lancashire County Council in 2011. The Assessment focuses on flood risk from surface water, groundwater and ordinary watercourses. It seeks to identify any areas of 'significant' flood risk from these sources (none with 30,000 people at risk identified in the County). The PFRA also establishes 'Locally agreed surface water information' for the Borough derived from EA's Flood Map for Surface Water.

7.6 The highest concentrations of local flood risk are predicted in the urban areas of Accrington, Bacup, Blackpool, Burnley, Colne, Chorley, Clitheroe, Lancaster, Ormskirk, Preston and Skelmersdale.

7.7 However, the Assessment recognises that flood management must not only be focused in the areas with the largest number of people or properties at risk but should also consider risk to the rural economy and also risk from catchments outside of the administrative boundary.

Surface Water Management Plans (SWMPs) and Ordinary Watercourse Studies

7.8 In order to assess the risk of surface water flooding, Lancashire County Council commissioned the Pendle, Burnley & Hyndburn Level 1 Surface Water Management Plan (SWMP), including the towns of Accrington, Burnley, Nelson, Colne, Barnoldswick and Earby (March 2012)

7.9 The SWMP Project has brought together existing flood risk information from Lancashire County Council, The Environment Agency and United Utilities to assess the surface water flood risk across the study area, first through a strategic review of flood risk and then an assessment of particular sites potentially at high risk from flooding. Site specific work in Burnley consisted of Ordinary Watercourse Studies at:

- Rosehill (Sep Clough Ordinary Watercourse)
- Turf Moor (Unnamed Ordinary Watercourse)
- Harle Syke (Walshaw Clough Ordinary Watercourse)

7.10 In all three cases recommendations were made for removal of debris and regular maintenance of the watercourses particularly culvert inlets and relevant riparian owners notified of their responsibilities.

Ordinary watercourses including culverted watercourses

7.11 The NPPG advises that local planning authorities should work with lead local flood authorities to secure Local Plan policies which are compatible with the local flood risk management strategy. Whilst the current Flood Zone based sequential approach to flood risk sets out clear methodology with regard to flood risk from main rivers or the sea, this does not deal with flood risk for example from smaller watercourses.

7.12 The main flood risk posed by local flow restrictions is potential blockage to a culvert either internally or at entrances/exits by accumulation of debris, particularly in storm conditions.

7.13 Many culverts within the Borough have not been inspected internally since construction and many would be very difficult and dangerous to inspect. As such it is thought there is also significant flood risk from potential collapse or structural damage e.g. by a fallen tree. In such an event water would force its way out through surface water drains.

7.14 Historically, no comprehensive survey of culverts within the Borough has been carried out. An Environment Agency survey of 14 culverts in Burnley Town Centre and Padiham was undertaken in 2009 as part of the Burnley Nelson and Colne FRMS.

7.15 In areas with many culverts Environment Agency advice is that development should not take place over a culvert, or within such proximity to a culvert that the loading would compromise its structure, thereby increasing the risk of collapse. The Agency promotes deculverting to restore narrow channelised river corridors to natural channels with sloping banks. This also removes structural assets which may be considered a liability to riparian landowners. The Agency will object to development involving the creation of new culverts over watercourses.

7.16 A combination of high water levels and debris can also lead to blockages at bridges. The location and design of bridges therefore needs to be taken into account when assessing flood risk.

7.17 Prior to the Flood and Water Management Act, providing consent for works on ordinary watercourses was the responsibility of the Environment Agency and enforcement activity was undertaken by the relevant district council. It is now, however, the responsibility of the LLFA (LCC) to manage both consenting and enforcement activity related to ordinary watercourses (except in those areas covered by an Internal Drainage Board). The LLFA's Ordinary Watercourse Consenting and Enforcement Policy (2014) sets out how Lancashire County Council will apply the relevant legislation and undertake its responsibilities for ordinary watercourse consenting and enforcement.

Surface Water Flooding and Management

7.18 Surface water run-off from built up areas with a conventional piped drainage systems can contribute significantly to flood risk both from watercourses and in the wider drainage system, in addition to potentially reducing recharge of groundwater and creating a direct pathway for pollutants

to pass in watercourses/groundwater. Surface water may also cause flooding directly where local topography, high river levels or defects in the drainage system cause it to collect.

7.19 The widespread flooding which affected many parts of the UK in summer 2007 demonstrated the severe financial and social consequences of surface water flooding in urban areas. Surface water flooding is predicted to increase as a result of climate change. Surface water was also found to have contributed to the fluvial flooding experienced in Burnley and Padiham December 2015.

7.20 The County Council's Preliminary Flood Risk Assessment (PFRA) (2011) found no Flood Risk Areas within the County meeting the thresholds of significance set by the Government. Based on information supplied by the Environment Agency, the largest flood risk 'cluster' is Blackpool with approximately 18,300 people estimated to be at risk from surface water flooding during a 0.5% probability (1 in 200 chance) rainfall event. This falls some way below the 'Significant' threshold of 30,000 people at risk. 7,795 people were identified as being at risk in Burnley and Pendle.

7.21 Ris k of Flooding from Surface Water (RoFSW) (May 2016) is the third generation national surface water flood map, produced by the EA, aimed at helping to identify areas where localised flash flooding can cause problems even if the Main Rivers are not overflowing. The RoFSW, used in this SFRA to assess risk from surface water, has proved useful in supplementing the EA Flood Map for Planning, by identifying areas in Flood Zone 1 which may have critical drainage problems. The EA's Risk of Flooding from Surface Water Map for Burnley Borough is at Appendix 1.

7.22 The Map has been used as a starting point to highlight areas where the potential for surface water flooding may need particular assessment and review within the Level 2 SFRA. The output from Level 2 work, drawing also on LLFA local flood records, can then be used to inform development allocations within the emerging Local Plan and outline the requirements for site specific Flood Risk Assessments to be carried out by developers.

Sewer Flooding

7.23 United Utilities (UU) is responsible for public sewers (i.e. adopted sewers) for foul, combined and surface water drainage in Burnley Borough. Private sewers are the responsibility of the owner. Sewer flooding is often caused by short intense rainstorms causing capacity in the local drainage system to be exceeded and/or by high levels in receiving waters.

7.24 UU advises that they are not currently (February 2017) engaged in any hydraulic flooding schemes in the Burnley area. However, they do have a large programme of ongoing CCTV inspection and desilting / cleaning in the area where a blockage or flooding from other sources has been reported.

7.25 If the system is to cope with planned levels of new development combined with the effects of climate change, the sustainable management of surface water will be essential in all designs. Under the Flood and Water Management Act 2010 the right of developers to connect to public sewer is conditional on inclusion of Sustainable Drainage Systems meeting new national standards. The County Council as LLFA is a statutory consultee on major developments which have surface water implications.

7.26 In preparing the new Burnley Local Plan, the Council is preparing an Infrastructure Delivery Plan which will provide a comprehensive assessment of the infrastructure needed to support the Plan. This will involve detailed discussions with the Environment Agency, Lancashire County Council and United Utilities amongst others.

Critical Drainage Areas

7.27 A Critical Drainage Area (CDA) is an area that has critical drainage problems and which has been notified to the local planning authority as such by the Environment Agency. There are currently no CDAs in the Burnley borough.

Groundwater flooding

7.28 Lancashire County Council's Preliminary Flood Risk Assessment 2011 (PFRA) considered the risk from groundwater flooding across Lancashire based on the Environment Agency's Areas Susceptible to Groundwater Flooding map data. Analysis showed the bulk of the area has low susceptibility to flooding from groundwater. Only three areas of note were identified, none within Burnley Borough.

7.29 Between 2013 when the LLFA was formed and 2015 Lancashire County Council recorded and investigated no cases of flooding in Burnley where groundwater was a primary or contributory cause.

7.30 Groundwater levels may increase due to prolonged heavy rainfall or recharge following reduced localised extraction. Climate change may increase the general risk of groundwater flooding but, due to an increasing demand for water, new extractions are constantly being licensed.

Reservoirs

7.31 The risk of flooding associated with reservoirs is associated with failure of reservoir outfalls or breaching. This risk is reduced through regular maintenance by the operating authority. Reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

7.32 The EA is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs (over 25,000 cubic metres of water) must be regularly inspected and supervised by reservoir panel engineers. Local authorities are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared.

7.33 Reservoirs can influence flood risk in their immediate catchment by regulating the flow of water but this is unlikely to impact on flood risk in the wider catchment.

7.34 Failure of a reservoir dam or embankment leading to uncontrolled or emergency emptying of the reservoir is extremely rare and is an emergency planning issue to be considered by the Council in conjunction with other emergency authorities.

7.35 A number of changes to the Reservoirs Act reflecting a more risk based approach are anticipated when the Flood and Water Management Act takes effect. These include:

- large raised reservoirs that are assessed as 'high risk' will be subject to full regulation
- large raised reservoirs that are not assessed as 'high-risk' will need to be registered but will not be subject to full regulation
- all incidents at reservoirs must be reported
- reservoirs that hold more than 10,000 (subject to Ministers agreement) cubic metres of water may be registered in future
- if registered, some reservoirs that hold more than 10,000 (subject to Ministers agreement) cubic metres of water that are assessed as 'high-risk' will be subject to full regulation

Table 7: EA Designated 'high risk' reservoirs in Burnley Borough

Reservoir	Designation	Grid Ref	Undertaker name
Cant Clough	final high-risk	SD8950030900	United Utilities plc
Cloughbottom	final high-risk	SD8460026700	United Utilities plc
Clowbridge	final high-risk	SD8240028000	United Utilities plc
Coldwell Upper	final high-risk	SD9050036000	United Utilities plc
Hurstwood	final high-risk	SD8870031600	United Utilities plc
Lee Green Reservoir	final high-risk	SD8800033700	United Utilities plc
Lower Coldwell	final high-risk	SD9020036400	United Utilities plc
Rowley Lake	final high-risk	SD8620032900	Burnley Borough Council
Swinden No.1	final high-risk	SD8890033300	United Utilities plc
Swinden No.2	final high-risk	SD8860033600	United Utilities plc
Walverden	final high-risk	SD8710036700	United Utilities plc

Reservoir Flood Maps

7.36 The EA has produced reservoir flood maps (RFM) for all large reservoirs that they regulate under the Reservoirs Act 1975.

7.37 The maps show the largest area that might be flooded if a reservoir were to fail and release the water it holds, including information about the depth and speed of the flood waters. In September 2016 the EA produced a RFM guide ' Explanatory Note on Reservoir Flood Maps for Local Resilience Forums – Version 5[1] which provides information on how the maps were produced and what they contain.

7.38 The RFM can be viewed nationally at: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map?map=SurfaceWater#Reservoirs_3-ROFR

Leeds & Liverpool Canal

7.39 As a controlled water body, the Canal does not pose a direct flood risk. The Canal and River Trust advise that although there have been some leaks which have caused minor damage to properties it is not aware of any large scale flooding issues to-date. It does have an emergency response team who are on twenty four hour cover to put measures in place to stop a flooding incident should this be needed.

7.40 However, the potential for breaching of the Canal's embankments, particularly along the Straight Mile in Burnley Town Centre, poses a significant residual risk which the SFRA needs to address. In addition the River Calder flows through the Straight Mile embankment in a narrow channel creating the potential for the embankment to act as a dam for water arising during any flooding of the river/ blockage of the culvert.

7.41 The risk of flooding at the River Calder/Straight Mile culvert was examined in detail in the Council's existing Level 2 SFRA completed by JBA Associates in 2009 (Flood risk advice for site in Burnley and Padiham, September 2009) However, the risk and implications of a breach of the

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/558441/LIT_6882.pdf

embankment, whether in conjunction with a flood incident around the culvert or otherwise, was not explored in depth.

7.42 It is therefore recommended that these issues are examined more closely via the updated Level 2 SFRA. For planning purposes this will facilitate the identification of development sites which will need to take account of risk from the Canal in Flood Risk Assessments.

Sustainable Drainage Systems (SuDS)

7.43 This refers to management practices and control structures designed to drain surface water from developments in a more sustainable way than some conventional techniques. Such practices and structures include green roofs, permeable paving, rainwater harvesting, swales, detention basins, ponds and wetlands. In addition to managing flood risk they can assist in improving water quality and increasing amenity and biodiversity.

7.44 A range of SUDS options are available (see references listed at Appendix 10). Not all will be appropriate for individual development sites. However, a sustainable drainage approach should be possible on almost every site. Which SUDS are applicable will be dependent on the local opportunities and constraints offered by a site, informed by the SFRA and/or Surface Water Management Plan (A Practice Guide Companion to PPS25 (December 2009)).

7.45 Development of SuDS locally, as in the UK generally, has been constrained to date by difficulties around adoption and maintenance of schemes. The Secretary of State for Communities and Local Government delivered a written ministerial statement on the implementation of sustainable drainage systems (SuDS) in parliament on 18 December 2014. The statement made changes to the National Planning Policy Framework (NPPF) which in turn made SuDS a material consideration in the determination of planning applications for major developments. These changes came into effect on 6 April 2015.

7.46 Alongside the changes to NPPF the Town and County Planning (Development Management procedure) (Enland) Order was amended making Lancashire County Council, in its role as Lead Local Flood Authority (LLFA), a statutory consultee in the planning process for major development proposals which have surface water implications, starting from 15 April 2015.

7.47 Consequently, developers need to provide SuDS on major developments where appropriate, while paying due regard to the following:

- National Planning Policy Framework
- Written statement on sustainable drainage systems (HCWS161)
- Planning practice guidance
- Non-statutory technical standards for sustainable drainage systems
- District local plan policies (please visit individual district councils)

8. Factors Affecting future Flood Risk

Climate Change

8.1 Continued climate change is likely to be characterised by warmer wetter winters and hotter drier summers, sea level rises and the general intensity of rainfall increasing. The number of properties at risk from flooding is increasing because of forecast climate change impacts.

8.2 The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. The NPPF and supporting planning practice guidance on Flood Risk and Coastal Change explain how Flood Risk Assessments should demonstrate how flood risk will be managed both now and over the development's lifetime, taking climate change into account.

8.3 **Environment Agency Guidance: Flood Risk Assessments: Climate Change Allowances published 19 February 2016** updates previous allowances and supports NPPF. It sets out available estimates of the impact of climate change in terms of increasing river levels by river basin district (in the case of Burnley, the North West RBD) for different periods of time over the next century. It also includes allowances for peak rainfall intensity in small and urban catchments.

8.4 EA will use these allowances as benchmarks when providing advice on Strategic Flood Risk Assessments and site specific Flood Risk Assessments for individual development; though where development plans or proposals were well advanced prior to publication of the new allowances, previous (2013) allowances will be used, unless the development is particularly sensitive to flood risk or in a vulnerable location in which case the new allowances will be used. Environment Agency Flood Zone maps do not take these climate change forecasts into account.

8.5 EA can give a free preliminary opinion to applicants on their proposals at pre-application stage. There is a charge for more detailed pre-application planning advice.

Other factors: Urban Development, Land Use Change/Land Management, Geomorphology

8.6 In urban areas, climate change will exacerbate the effects of the increased thermal capacity of built up areas (urban heat island effect) and the accelerated run off they produce.

8.7 In upland areas of the Borough changes to land management methods particularly relating to drainage or grazing practices can influence flood risk in other parts of the catchment.

8.8 The build-up of sediment and erosion in river channels can significantly influence flood risk. Processes of sedimentation and erosion occur naturally but the stability of river channels can itself be influenced by human activities, i.e. land use and management, and by climate change. Flood risk management activity can influence these processes (and reduce river-floodplain connectivity) and flood protection measures can be undermined by them. Retaining walls, weirs and culverts constrain parts of the River Calder at old mill sites in urban Burnley. Inadequate fencing, livestock trampling and growth of Himalayan Balsam can be significant factors in rural reaches.

8.9 A channel's propensity for instability is known as its geomorphological sensitivity (GSI). Certain reaches in the catchment were found to have a high GSI including Burnley (RRCFMP). The Calder has medium to high GSI due to the combined influence of drift geology topography and land use (glacial till occurs in grass and moorland areas that have steep slopes) and as such is susceptible to future instability.

8.10 Environment Agency research for the RRCFMP found that climate change is likely to have a bigger effect on future flood risk at catchment level than other factors such as urbanization or land use change, though the effect is reduced by the availability of floodplain attenuation and storage.

9. Flood Risk and the Local Plan

The Local Plan

9.1 Burnley's Local Plan will cover the whole of Burnley borough and look ahead to 2032. It will provide the statutory planning framework for the borough. The Plan will be used to guide decisions on planning applications and areas where investment should be prioritised. Once adopted, it will replace the 'saved' 2006 Burnley Local Plan Second Review.

9.2 The Plan will contain a vision, objectives and an overall strategy for development. This will include policies on both the scale of development and its overall pattern across the borough. It will allocate many of the sites that are needed to accommodate new development along with areas to be protected or enhanced. It will also set out policies on how planning applications on both allocated and 'windfall' sites will be judged.

9.3 The NPPF and the accompanying NPPG 'Planning Guidance on Flood Risk and Coastal Change' indicates that development should be directed to areas at the lowest risk of flooding and that Local Plans should apply a sequential approach to the location of development to avoid, where possible, flood risk to people and property and to manage any residual risk, taking account of the impacts of climate change. To inform this approach the Council has prepared this Strategic Flood Risk Assessment (SFRA) drawing on information on all potential sources of flooding from the Environment Agency, the County Council as Lead Local Flood Authority for Lancashire and United Utilities.

The Sequential Test

9.4 The NPPF states that "the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Strategic Flood Risk Assessment will provide the basis for applying this test. A sequential approach should be used in areas known to be at risk from any form of flooding. (NPPF Paragraph 101)

9.5 If, following application of the Sequential Test, it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. For the Exception Test to be passed:

- *it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared;*

and

- *a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

Both elements of the test will have to be passed for development to be allocated or permitted." (NPPF 102)

9.6 The application of the Sequential Test in this report has been undertaken to conform to this approach. Where an Exception Test is required this essentially becomes part of the Sequential Test. The first part of the Sequential Test – the 'sequential approach' element can be demonstrated through the SFRA or through the SHLAA and SA/SEA and in Burnley's case these do provide key evidence for this. Other studies also support this e.g. the HRA, SHMA, ELDS, Plan Viability Assessment, Ecological

Studies and the Plan itself includes within it a summary justification for its spatial strategy and approach to site selection. These all need to read as a whole to understand all the detail of how and why the Council has reached its conclusions.

9.7 It is important to note that sequential testing/approach is also relevant to site selection against other planning factors, if perhaps less formally so than for flood risk e.g. prioritizing the use of previously developed land, except where this is of high biodiversity value; avoiding the Green Belt, minimising the need to travel etc. The site selection process is an iterative one, as outlined in the Site Allocations Background Paper.

9.8 Subject to the Exception Test being passed where required, the Sequential Test can be passed **if** the Council can demonstrate that the Plan's requirements cannot be met on sites with lower flood risk.

The SHLAA and the Sequential Approach

9.9 The sites considered for allocation in the Local Plan were identified from a range of sources and all housing and employment sites have been assessed through the Council's Strategic Housing and Employment Land Availability Assessment (SHLAA). Gypsy and Traveller and Town Centre sites have been subject to a similar process of assessment.

9.10 The Council's initial SHLAA of July 2016 looked at all potential housing and employment sites against a number of criteria, including flood risk, and drew up a list of **'developable'** sites, with those over 0.4 hectares considered for allocation in the Local Plan. This initial SHLAA was informed by EA published Flood Zone and Surface Water mapping, ongoing liaison with LLFA, previous SFRA Level 1 and 2 work, and consideration of the vulnerability classification of the proposed development .

9.11 The list of proposed allocations has been subject to a number of refinements through the three rounds of Plan consultation (Issues and Options, Issues and Options Additional Sites and Preferred Options), and through the process of Sustainability Appraisal (SA)/Strategic Environmental Assessment (SEA)/Habitats Regulations Assessment (HRA). The process of selection is summarised in the Council's 'Site Allocations Background Paper'.

9.12 Following Preferred Options, JBA Consulting were commissioned to undertake an updated SFRA. As part of their work they re-screened all of the SHLAA and hence Plan sites in January 2017. These sites include all the 'reasonable alternatives' considered as part of the of the Local Plan's Strategic Environmental Assessment (incorporated into the Sustainability Appraisal).

9.13 This has informed the Proposed Submission Plan. Although the June 2016 SHLAA had ruled out some sites as '**excluded'** and '**not developable'**, JBA re-screened all of the sites as flood risk issues can: a) result in sites being excluded or classed as not developable, or b) in cases where there is a shortfall of developable sites, some of the assumptions that led to sites being ruled out as potential allocations may need to be revisited.

9.14 Importantly , this rescreening reassessed the SHLAA sites against the revised confirmed extent of Flood Zone 3b which is one of the requirements of the sequential test set out in the NPPF but is not defined nationally by the EA (see para 4.13 of this report); and also against updated EA surface water flood risk mapping.

Level 1 Screening Assessment Methodology

9.15 The screening assessment consists of a detailed spreadsheet of all site results (Appendix 2) an accompanying summary report (Appendix 3) setting out the key findings and recommendations, and a set of interactive pdf maps providing coverage of the whole borough. Each individual map within this set illustrates :

- Flood risk from rivers/EA Flood Zones (Source: EA - Flood Map for Planning (Rivers and Sea)
- Flood risk from surface water (Source: EA- Risk of Flooding from Surface Water)
- Flood risk from groundwater (Source: EA - Areas Susceptible to Groundwater Flooding)
- Flood Risk Management (Source: EA- Spatial Flood Defences)
- Flood risk from Rivers and Sea (EA – Risk of Flooding from Rivers and Sea*)

9.16 *This map takes into account the effect of flood defences, unlike the Flood Map for Planning. However, the latter should be used for general planning purposes.

9.17 In order to inform the Sequential Approach to the allocation of sites, the assessment entails a high level GIS screening exercise overlaying potential development site allocations against Flood Zones 1, 2, 3a and 3b and calculating the area of each site at risk.

9.18 Flood Zones 1, 2 and 3a are sourced from the Environment Agency's (EA) Flood Map for Planning (Rivers and Sea) and Flood Zone 3b (functional floodplain) was defined as part of this assessment. Surface water risk to potential sites is assessed by way of the EA's Risk of Flooding from Surface Water (RoFSW) map.

9.19 The resulting Development Site Assessment Excel spreadsheet provides a breakdown of each site and the area (in hectares) and percentage coverage of each fluvial flood zone and each surface water flood zone (high, medium and low). Fluvial Flood Zones 3b, 3a, 2 and 1 are considered in isolation. Any area of a site within the higher risk Flood Zone 3b that is also within Flood Zone 3a is excluded from Flood Zone 3a and any area within Flood Zone 3a is excluded from Flood Zone 2. This allows for the sequential assessment of risk at each site by addressing those sites at higher risk first.

9.20 270 potential development sites were assessed. These were sub divided according to proposed uses including:

- Housing : 175 sites
- Employment; 74 sites
- Residential and or employment and/or town centre uses (mixed use): 18 sites
- Gypsy and Traveller : 2 sites
- Town Centre uses: 1 site

9.21 Development viability is assessed based on the sites' flood risk vulnerability classification (Table 2 of Flood Risk and Coastal Change Planning Practice Guidance - see Appendix 7) and subsequent strategic recommendations made as follows:

- Strategic Recommendation A
- consider withdrawing the site based on significant level of fluvial or surface water flood risk

- Strategic Recommendation B
- Exception Test required if site passes Sequential Test

- Strategic Recommendation C
- consider site layout and design around the identified flood risk if site passes Sequential Test

- Strategic Recommendation D
- site specific FRA required

- Strategic Recommendation E
- site permitted on flood risk grounds due to little perceived risk, subject to consultation with LPA/LLFA

9.22 The criteria for making each recommendation are set out in the JBA Report which accompanies the spreadsheet (Appendix 2). The table below shows how many of sites received the various recommendations.

Table 8: Number of sites per Strategic Recommendation

Site/Proposed use	Strategic Recommendation				
	A	B	C	D	E
Housing	13	1	16	117	28
Employment	0	0	13	41	20
Mixed Use	3	3	1	10	1
Gypsy and Traveller	0	0	0	1	1
Town Centre Uses	0	0	1	0	0
Total	**16**	**4**	**31**	**169**	**50**

9.23 The JBA Report provides discussion a number of sites found to be at significant risk. This process helps to confirm the scope of the Level 2 assessment of sites, including those are required to pass the Exception Test.

Understanding Future Risk – Climate Change

9.24 JBA's Interim Level 2 SFRA will assess what is required in terms of the EA's February 2016 climate change allowances, and land use changes on those proposed development sites identified as being at risk of flooding through Level 1 screening. It is unlikely that any local hydraulic modelling studies will have incorporated these new allowances into their outputs. However, JBA propose that indications of future flood risk can be gained using topography and Flood Zone 2 as a guide to what Flood Zone 3 may become in 100 years' time.

Risk of Flooding from Reservoirs

9.25 All development sites proposed for allocation in the Council's Proposed Submission Local Plan have also been subject to an initial assessment by the Council in terms of flood risk from reservoirs in the borough. This was carried out using the EA's online Risk of Flooding from Reservoirs mapping. Results were incorporated in the Council's Sequential Test analysis (see Appendix 8).

10. Conclusions from Level 1 Assessment

General Conclusions

10.1 Fluvial flooding from the Calder and its tributaries (particularly the Brun in Burnley and Pendle Water and Green Brook in Padiham) is the main source of flood risk in the Borough.

10.2 The Burnley Nelson and Colne Flood Risk Management Strategy 2011 has identified seven principal flood risk reaches within the borough. In Burnley itself the main areas at risk of fluvial flooding are Burnley Town Centre, the adjacent Burnley Wood and Fulledge neighbourhoods, and the Thompson Park/former Burnley College Site. In Padiham flood risk reaches follow the River Calder and Green Brook to their confluence in the town centre and a further reach is identified on Green Brook Upper to the south of Padiham.

10.3 The Risk of Flooding from Surface Water map (RoFSW) indicates that surface water flood risk is prevalent across the Borough though with particularly significant/extensive areas at risk in Burnley Wood/Fulledge, Burnley Town Centre, Daneshouse and Lowerhouse.

10.4 Where areas at risk of surface water flooding overlap with areas of fluvial flooding, flood risk is exacerbated. However, areas located in Flood Zone 1 with low fluvial flood risk can often have surface water flood risk issues and/or include ordinary watercourses. Therefore consultation with the LLFA is recommended on all development sites including those where a formal FRA may not normally be required.

10.5 Based on Areas Susceptible to Groundwater Flooding the borough has generally low susceptibility to flooding from groundwater. Recent historical records from the LLFA confirm this with no cases where groundwater was a primary or contributory cause.

10.6 Potential blockage or collapse at many of the old culverts covering all or part of watercourses within the borough adds further risk. Many of these culverts have never been inspected and doing so would, in many cases, be difficult and or dangerous.

10.7 There is a legacy of dependency on flood defences in Burnley and Padiham. Many of these are old, privately owned and poorly maintained. The Environment Agency is addressing areas of highest priority within the Borough while at the same time aiming to reduce dependency by encouraging and developing sustainable alternative flood risk management approaches.

10.8 Climate change is forecast to cause significant increases in peak rainfall intensity and peak river flow. Climate change is expected to significantly increase the risk of flooding not only from fluvial but also from non fluvial sources (particularly surface water and other ‘local’ sources).

10.9 Environment Agency forecasts of increased fluvial flow as a result of climate change would significantly increase property damages in a 1% AEP event in the Calder Catchment's main centres of population and increase agricultural damage in rural areas. Flood impacts in Burnley and Padiham will have high economic and social costs as relatively high levels of deprivation/vulnerable residents would significantly reduce the prospects of recovery from such events.

10.10 A SuDS approach should be adopted wherever possible, both at a strategic level in the development and management of the Borough’s green infrastructure and in all new development, particularly in major development opportunities. In addition to reducing flood risks from surface water run off, SUDS schemes should aim to maximize potential benefits for water quality, amenity and biodiversity.

10.11 There is a residual risk of a major flood event resulting from a failure at one of the Borough's 'high risk' reservoirs or breach of the Leeds Liverpool Canal embankment, in particular at the Straight Mile in Burnley Town Centre. However, due to the active management and regular maintenance of these structures this risk is very low.

Screening Results Conclusions (See Table 8 above)

10.12 The Level 1 screening assessment of 270 sites considered all sources of flooding including fluvial, surface water and other local sources.

10.13 Of these, 219 sites were considered suitable for development in flood risk terms subject to site specific Flood Risk Assessment and/or consultation with LPA/LLFA at the planning application stage (recommendations D and E). At a further 31 sites it was considered that flood risk could be effectively reduced or mitigated through appropriate site layout and design if these passed the sequential test where one was required (recommendation C).

10.14 Of the remaining 20 sites where significant flood risk issues were identified (recommendations A and B), 6 were considered not developable through the Council's SHLAA process. 8 were considered developable but were not selected as Local Plan allocations. 6 sites are proposed as Local Plan site allocations but 3 of these already have planning permission.

Application of the Sequential Test

10.15 13 sites were subject to the Sequential Test and all have been included in the Local Plan as proposed housing, employment and town centre allocations (these include sites with recommendation A or B or C).

10.16 9 of these sites (listed in Table 9 below) have been subject to Level 2 SFRA in order to fully assess the level and extent of flood hazards and where appropriate inform the Exception Test. The other 4 sites were not put forward for Level 2 SFRA as they already have planning permission and flood risk issues are therefore deemed to have been addressed. These sites are listed in Appendix 8.

10.17 The application of the Sequential Test indicates that 1 housing site is required to pass the Exception Test.

10.18 Detailed consideration of Sequential Test results is provided at Appendix 8.

10.19 It important to note that a number of the sites only required a Level 2 SFRA because of a small area of the site being within Flood Zone 3 a or b which could have been excluded from the site boundaries. However it was considered sensible to include this land within the site's boundaries even though the land in question may be retained and enhanced as GI/SuDS. In some cases these areas could have been used for site access. These areas were included in order to properly assess site layouts and safe access and egresses.

Table 9: Level 2 SFRA sites

Site and SHLAA Ref.	Local Plan Ref	Proposed use and vulnerability classification	Reason for Level 2 assessment	Level 1 SFRA Recommendation
HEL/011u Baxi Potterton	HS1/5	Housing (more vulnerable)	Proposed use 'more vulnerable'. Approx. 65% of the site is located within FZ3 (mainly FZ3a with a small part in FZ3b). To inform the second part of the Exception Test.	B – Exception Test

HEL/043 Former Hameldon School Sites	HS1/1	Housing (more vulnerable)	Small area of site within FZ3a. To inform site layout and design around flood risk including drainage/surface water/SUDs strategy	C- Consider site layout and design around flood risk
HEL/165 Vision Park (West and North Sites)	EMP1/3	Employment (less vulnerable)	Small area of site within FZ3a. Over 50% of site within FZ2. To inform site layout and design around flood risk including drainage/surface water/SUDs strategy	C- Consider site layout and design around flood risk
HEL/171 Shuttleworth Mead South (Eaves Barn Farm)	EMP1/13	Employment (less vulnerable)	Small area of site within FZ3a. Over 80% of site within FZ2. To inform site layout and design around flood risk including drainage/surface water/SUDs strategy	C- Consider site layout and design around flood risk
HEL/189 Land South of Network 65	EMP1/5	Employment (less vulnerable)	Small area of site within FZ3a and FZ3b. To inform site layout and design around flood risk including drainage/surface water/SUDs strategy	C- Consider site layout and design around flood risk
HEL/223 Thompson Centre Car Park	EMP1/8	Employment/Town Centre (less vulnerable)	36% of the site at medium risk of surface water flooding with a further 57% at low risk. To assess flood depths and hazards and inform site layout and design around flood risk including drainage/surface water/SUDs strategy	A-Consider withdrawal of site
HEL/249 Land NE of Sycamore Avenue	HS1/34	Housing (more vulnerable)	Over 30% of site at high or medium risk of surface water flooding, with a further 26% at low risk. To assess flood depths and hazards and inform site layout and design around flood risk including drainage/surface water/SUDs strategy	A - Consider withdrawal of site
TC1/4 Curzon Street	TC1/4	Town Centre (including more vulnerable A4 uses)	Small area of site within FZ3a. To inform site layout and design around flood risk including drainage/surface water/SUDs strategy. Also to investigate opportunity for deculverting on the site in terms of flood risk effects.	C - Consider site layout and design around flood risk
HEL/067 Former Gardner Site	HS1/17	Housing (more vulnerable)	Over 20% of site at low risk of surface water flooding. To inform site layout and design around flood risk including drainage/surface water/SUDs strategy.	C - Consider site layout and design around flood risk

Outcome of the Sequential Test

10.20 Below is set out the Council's Sequential Test conclusion against the required steps set out in Diagram 2 of NPPG (Flood Risk and Coastal Change Planning Practice Guidance)

- Through the SHLAA process the Council concluded that it **could not** meet its requirements by allocations solely within Flood Zone 1.
- Through the SHLAA process the Council concluded that it **could not** meet its requirements by allocations solely within Flood Zones 1 and 2.
- Through the SHLAA process the Council concluded that it **could not** meet its requirements by allocations solely within Flood Zones 1 and 2 and the lowest risk sites available in Flood Zone 3.
- Through the SHLAA process the Council concluded that it **could not meet its requirements for housing** by allocations solely within Flood Zones 1 and 2 and the lowest risk sites available in Flood Zone 3 and with housing being a 'more vulnerable' the **Exception Test was required through a Level 2 SFRA.**
- Through the SHLAA process the Council concluded that it **could meet its requirement for employment** allocations solely within Flood Zones 1 and 2 and the lowest risk sites available in Flood Zone 3 and with employment being a 'less vulnerable' the Exception Test was not required. However in some cases a Level 2 assessment was commissioned to better inform potential site layout, design and drainage considerations and other flood risk mitigation measures required and in response to EA advice.

Appendix 1: SFRA Level 1 Mapping

See separate Appendix files

Appendix 2:SFRA Level 1: Development Sites Screening Assessment

See separate Appendix file

Appendix 3: SFRA Level 1: Development Sites Screening Assessment Summary Report

See separate Appendix files

Appendix 4: Principal Flood Risk Reaches in Burnley (Burnley Nelson and Colne Flood Risk Management Strategy 2011)

See separate Appendix files

Appendix 5: Flood Zones (Flood Risk and Coastal Change Planning Practice Guidance)

(Table 1 of Flood Risk and Coastal Change Planning Practice Guidance)

These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's Flood Map for Planning (Rivers and Sea).

Zone 1 - low probability **Definition** Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3).
Zone 2 - medium probability **Definition** Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year. (Land shown in light blue on the Flood Map).
Zone 3a - high probability **Definition** Land having a 1 in 100 or greater annual probability of river flooding; or a 1 in 200 or greater annual probability of flooding from the sea in any year. (Land shown in dark blue on the Flood Map).
Zone 3b - the functional floodplain **Definition** Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

The Flood Zones shown on the Environment Agency's Flood map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

Appendix 6: Flood Risk Vulnerability (Flood Risk and Coastal Change Planning Practice Guidance)

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police stations, ambulance stations; fire stations and command centres; telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as 'Essential Infrastructure').

More vulnerable

- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.[7]

Less vulnerable

- Police, ambulance and fire stations which are *not* required to be operational during flooding.
- Buildings used for shops, financial, professional and other services; restaurants and cafes, hot food takeaways; offices; general industry, storage and distribution, non–residential institutions not included in 'More Vulnerable' class; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill* and hazardous waste facilities).

- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do *not* need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

*Landfill is as defined in Schedule 10

Appendix 7: Flood Risk Vulnerability and Flood Zone 'compatibility' (Flood Risk and Coastal Change Planning Practice Guidance)

(Table 3 of Flood Risk and Coastal Change Planning Policy Guidance)

Flood Zones (see table 1)	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water compatible
Zone 1	☑	☑	☑	☑	☑
Zone 2	☑	Exception Test required	☑	☑	☑
Zone 3a	Exception Test required	☒	Exception Test required	☑	☑
Zone 3b	Exception Test required	☒	☒	☒	☑

Key:
☑ Development is appropriate
☒ Development should not be permitted

Notes to Table 3:

- This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1 first, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water compatible uses, should be designed and constructed to:

- Remain operational and safe for users in times of flood;
- Result in no net loss of floodplain storage
- Not impede water flows and not increase flood risk elsewhere

Appendix 8: The Sequential Tests

The Level 1 SFRA Screening results can be seen in Appendix 2.

Tables A8a and A8b extract the results for the sites identified for allocation in the Proposed Submission Local Plan. For each site they set out:

- Site area
- Percentage area of the site within each Flood Zone
- Level of risk from surface water
- Level of risk from reservoir flooding
- Vulnerability classification of the proposed use

Housing Sites: Level 1 Screening Results

Table A8a demonstrates that of the 39 sites that are proposed to be allocated for housing, 31 are wholly within Flood Zone 1.

Of the remaining 8 sites:

- 4 sites contain land within Flood Zone 2. Three of these involve a small percentage (less than 10%) One involves a large percentage (over 60%).
- 3 sites contain land within Flood Zone 3a. Two of these involve a small percentage (less than 1%) One involves a large percentage (over 60%).
- 2 sites contain a small percentage of land within Flood Zone 3b.

Flood Zone 1 sites

The 31 sites that fall entirely within Flood Zone 1 are considered to be at a low risk of flooding from rivers or the sea. Consequently, the principle of developing these sites for housing (a use classed as 'more vulnerable') would satisfy the Sequential Test in relation to fluvial flooding. However, and in accordance with national guidance, there is a need to consider the susceptibility of sites to other sources of flood risk as, for example, a site that is located entirely within Flood Zone 1 may be prone to surface water flooding.

The majority of these 31 sites do have some susceptibility to surface water flooding. Nevertheless, the SFRA screening indicates that in each of these instances only 4 of the sites are considered to be at a significant risk of surface water flooding (defined as having more than 10% site area at high or medium risk and/or over 20% site area at low risk). Consequently, the actual level of risk associated with surface water flooding is expected to be low for most of these sites. In addition, given that only a very small percentage area of these sites are vulnerable to surface water flooding, it is probable that any housing development that takes place on these sites could be directed away from the parts of the site that are susceptible to surface water flooding.

Of the 4 sites with significant surface water flood risk, 3 have planning permission and are therefore deemed to have satisfactorily addressed surface water issues. Sequential Test discussion of the fourth site is set out below.

As set out in table A8a, no sites in Flood Zone 1 are identified as being at risk of flooding associated with reservoir failure.

Flood Zone 2 sites

Of the 4 sites partially within Flood Zone 2, two already have planning permission and are therefore deemed to have passed the Sequential Test. Sequential Test discussion for the remaining 2 sites is set out below.

Of these 4 sites only 1 is at significant risk of surface water flooding (defined as having more than 10% site area at high or medium risk and/or over 20% site area at low risk) and this site already has planning approval (HS1/23 Perseverance Mill, Padiham).

Consequently, the actual level of risk associated with surface water flooding is expected to be low for these sites. In addition, given that only a very small percentage area of these sites is vulnerable to surface water flooding, it is probable that any housing development that takes place on these sites could be directed away from the parts of the site that are susceptible to surface water flooding.

As set out in table A8a, no sites in Flood Zone 2 are identified as being at risk of flooding associated with reservoir failure.

Flood Zone 3a sites

Of the 3 sites partially within Flood Zone 3a, one already has planning permission and is therefore deemed to have passed the Sequential and Exception Tests. Sequential Test discussion for the remaining 2 sites is set out below.

Of these 3 sites only 1 is at significant risk of surface water flooding (defined as having more than 10% site area at high or medium risk and/or over 20% site area at low risk) and the site already has planning approval (HS1/23 Perseverance Mill, Padiham).

Consequently, the actual level of risk associated with surface water flooding is expected to be low for these sites. In addition, given that only a very small percentage area of these sites is vulnerable to surface water flooding, it is probable that any housing development that takes place on these sites could be directed away from the parts of the site that are susceptible to surface water flooding.

As set out in table A8a, 1 site in Flood Zone 3a is identified as being at risk of flooding associated with reservoir failure. Sequential Test discussion for this site is set out below.

Flood Zone 3b sites

Of the 2 sites partly within Flood Zone 3b, 1 already has planning permission and is therefore deemed to have retained these areas within the functional floodplain in accordance with national policy/practice guidance. Sequential Test discussion for the remaining site is set out below.

Of these 2 sites, neither is at significant risk of surface water flooding (defined as having more than 10% site area at high or medium risk and/or over 20% site area at low risk). As stated above, 1 already has planning permission.

Consequently, the actual level of risk associated with surface water flooding is expected to be low for these sites. In addition, given that only a very small percentage area of these sites is vulnerable to surface water flooding, it is probable that any housing development that takes place could be directed away from the parts of the site that are susceptible to surface water flooding.

As set out in table A8a, 1 site in Flood Zone 3b is identified as being at risk of flooding associated with reservoir failure. Sequential Test discussion for this site is set out below.

Housing Sites: Assessments

The following sites shown to be at risk in table A8a already have planning permission and have therefore not been included in Sequential Test summaries below or the Level 2 SFRA.

- HS1/3 Former William Blythe's Site
- HS1/14 Waterside Mill
- HS1/23 Perseverance Mill
- HS1/30 Brampton House

Profiles/Sequential Test summaries of all the proposed housing allocations that fall partly within Flood Zones 2, 3a or 3b and/or have been identified as being at significant risk of surface water flooding have been set out to highlight the development potential of the sites and provide reasons why this could not be met on other sites.

Name of Site:	**HS1/1 Former Hameldon Schools site**
Level 1 Site Assessment Ref	HEL/043
Proposed Use	Housing
Site Flood Zone	1 (99.96%), 2 (0.02%), 3a (0.02%), 3b (0%) Main river: Sweet Clough
Does the site lie in the functional floodplain (Zone 3b)	No
Is the proposed use acceptable in this Flood Zone	The vast majority of the site is within FZ1. A very small part of the site is located within FZ2 which is not sequentially preferable for development and also within FZ3a where development would need to pass the Exception Test.
Is the site considered to be at risk from other forms of flooding	The site is at low risk of surface water flooding (less than 1% high or medium risk, less than 5% low risk). The site is not at risk of flooding resulting from reservoir failure.

Consideration:

This is a partly landscaped former school site with playing fields and numerous mature trees. It lies within the established urban area and is part greenfield and part brownfield

Fluvial flood risk is confined to a very small area of the site and can be negated by appropriate layout and design e.g. by incorporating land within high risk areas into open space/green infrastructure provision. It is intended that a substantial area of multi-functional green infrastructure through the central area of the southern half of the site should be retained both for flood risk and wider planning purposes as set out in Policy HS1/1. The indicative housing figures for the site (250) fully reflect this.

Surface water flood risk is also low and can be mitigated by appropriate layout, design and a sustainable drainage strategy in line with Proposed Local Plan Policy CC5.

The site is not at risk of flooding resulting from reservoir failure.

Summary assessment of alternative sites:

The former school site is currently in public sector ownership (LCC) and is no longer required for educational use. This large site, the largest in the Plan, provides an opportunity for a significant housing development on a partly previously developed site and is of a scale which can create a development with its own sense of place in an attractive and highly sustainable location with good access to public transport. Policy HS1/1 expects a scheme of the highest quality which clearly and demonstrably contributes to increasing housing quality and choice across the borough recognizing that this is in part a greenfield site.

The opportunity to create a highly sustainable development of this size and mix within the urban area is unique in Burnley. In accommodating the quantity and quality of development proposed, the site will reduce pressure for further greenfield release in the countryside.

There are therefore no other housing sites which could offer the opportunity this site does that at a lower risk of flooding and the site is therefore considered to pass the Sequential Test.

Name of Site:	**HS1/5 Former Baxi site**
Level 1 Site Assessment Ref	HEL/011u
Proposed Use	Housing
Site Flood Zone	1 (26.70%), 2 (9.00%), 3a (63.1%), 3b (1.17%) Main river: River Calder
Does the site lie in the functional floodplain (Zone 3b)	A small percentage of the site (1.17%) is within Zone 3b.
Is the proposed use acceptable in this Flood Zone	The majority of the site is within FZ3a with a small percentage within FZ3b. A further 9% of the site is within FZ2. Residential use in FZ3a would be required to pass the Exception Test. Residential use would not be acceptable in FZ3b
Is the site considered to be at risk from other forms of flooding	The site is not at significant risk of surface water flooding (less than 10% high or medium risk, less than 20% low risk). A culvert runs along the northern edge of the site. EA Reservoir flood maps show the site is at risk of flooding resulting from failure of a reservoir due to the impact of such an event on the adjacent River Calder.

Consideration:

Located on the edge of Padiham adjoining agricultural land adjacent to the River Calder, the site was developed in the 1950s to accommodate a large manufacturing business (Baxi Potterton). It has been vacant since the closure of the Baxi plant in 2007.

Over 26% of the site is within Flood Zone 1 and is therefore at low risk and compatible with residential development. A further 9% within Flood Zone 2 is also compatible in principle according Planning Practice Guidance for Flood Risk and Coastal Change.

A small percentage (1.17%) within Flood Zone 3b should not developed and be left as functional floodplain.

A large area of the site (over 63%) is within Flood Zone 3a. Policy HS1/5 requires that part of this area, the southern part of the site adjoining the River Calder, be retained/developed as multi-functional green infrastructure. Whilst the indicative housing figures for the site (244) reflect this, it would require housing within land in FZ3a and the site will require a Level 2 SFRA to fully assess flood extents, depths, velocities and hazards within Flood Zone 3a including the impact of climate change and establish whether development could be achieved safely over its lifetime and pass the Exception Test.

Surface water flood risk is low. Advice as to how this can be mitigated by appropriate layout, design and a sustainable drainage strategy in the context of wider flood risk at the site should also be considered as part of the Level 2 Assessment.

A culvert runs along the northern edge of the site. No development should take place within 8m of this culvert.

Summary assessment of alternative sites:

The site had been extensively marketed by agents but there had been no interest from potential occupiers. Due to its size location and access difficulties and lack of market demand, the Council's 2016 SHLAA concluded that it was no longer viable as an employment site.

The site provides an opportunity for a significant housing development on brownfield land in an attractive and highly sustainable location close to Padiham town centre, local amenities and public

transport. This is the second largest proposed allocation in the Local Plan at 244 dwellings and one of only 3 in Padiham, the others being considerably smaller (41 and 56 dwellings). Padiham is heavily constrained by adjacent Green Belt, the boundary of which abuts the site.

The size of the site and its riverside, edge of town location would allow a development which creates its own sense of place, provides for a mix of housing types and a scheme of the highest quality which clearly and demonstrably contributes to increasing housing quality and choice across the borough.

Redevelopment of the site delivers wider sustainability benefits:

It provides an opportunity to remove industrial traffic from the surrounding residential streets and an opportunity to remediate the land.

It provides an opportunity to address current flood risk issues on the site and the adjacent areas of Padiham town centre. The Environment Agency has examined options to provide flood protection for Padiham including works along this stretch of the Calder. The development of housing on the Baxi site would provide an opportunity to contribute to this including through direct works on site and/or through planning contributions and would improve the cost benefit ratio to justify public sector investment in flood risk management measures that would protect the site and wider area.

The opportunity to create a highly sustainable development of this size and mix within the urban area is unique in Padiham. In accommodating the quantity and quality of development proposed, the site will reduce pressure for further greenfield release in the countryside.

There are therefore no other housing sites in Padiham which could offer the opportunity this site does that are at a lower risk of flooding (i.e. wholly in Flood Zone 1 or 2). The site is therefore considered to pass the Sequential Test. However, as the site includes land within Flood Zone 3a and the proposed residential use is 'more vulnerable', the site will need to pass the **EXCEPTION TEST** before it can allocated in the Local Plan.

Name of Site:	**HS1/17 Former Gardner Site**
Level 1 Assessment ref	HEL/067
Proposed Use	Housing
Site Flood Zone	1 (100%)
Does the site lie in the functional floodplain (Zone 3b)	No.
Is the proposed use acceptable in this Flood Zone	Yes. The site is wholly within FZ1 where residential development is acceptable in terms of fluvial flood risk. However, there is surface water flood risk as outlined below.
Is the site considered to be at risk from other forms of flooding	Yes. More than 20% (24.28) is at low risk of flooding from surface water. A culverts crosses the site which contains an ordinary watercourse. The site is not at risk of flooding resulting from reservoir failure.

Consideration:

The site consists of hardstanding and former industrial buildings in the process of being demolished. Fortified walls surround the site.

The site has been partially vacant since the occupiers relocated in 2011. Continued employment use is considered to be of only marginal viability due to its location in a predominantly residential area with poor access and remediation work required.

The site is entirely within Flood Zone 1 and fluvial flood risk is therefore low. Surface water flood

risk, although low, is extensive. However, it is considered that this can be effectively reduced by appropriate layout, design and a sustainable drainage strategy.

A culvert runs through the site containing an ordinary watercourse. Any development within the easement would require consent from Lancashire County Council as the LLFA. The culvert should if practical be opened up and integrated within the design or left undeveloped with an 8m easement on either side.

The site is not at risk of flooding resulting from reservoir failure.

Summary assessment of alternative sites:

The site provides an opportunity for a significant housing site on brownfield land within a highly sustainable location within the urban area which will contribute positively to the continued regeneration of the area. It provides an opportunity to remove industrial traffic from the surrounding residential streets and an opportunity to remediate the land. There is an opportunity to open the site up with through routes for pedestrians and cyclists along with introduction of green infrastructure. The site has potential to deliver positive regeneration benefits .

The site is located within FZ1. Other reasonable alternatives within this area of Burnley include similar previously developed sites (e.g. Lawrence Avenue) which face similar challenges in terms of surface water risk, culverts etc, which development can positively address and so are not sequentially preferable in flood risk terms. The development on modestly sized urban brownfield sites such as this site helps reduce pressure for further greenfield release both within the urban area and in the countryside.

On this basis the site is considered to pass the Sequential Test.

Name of Site:	**HS1/24 Land NE of Sycamore Ave**
Level 1 Assessment ref	HEL/249
Proposed Use	Housing
Site Flood Zone	1 (100%)
Does the site lie in the functional floodplain (Zone 3b)	No
Is the proposed use acceptable in this Flood Zone	Yes. The site is wholly within FZ1 where residential development is acceptable in terms of fluvial flood risk. However, see surface water flood risk below.
Is the site considered to be at risk from other forms of flooding	Yes. More than 20% (20.94) is at high risk of flooding from surface water, a further 10.12% is at medium risk and a further 25.96% is at low risk. A culvert runs under the highway close to the southern boundary of the site. The site is not at risk of flooding resulting from failure of a reservoir.

Consideration:

The site is part of a larger site which was formerly a textile and dye works and contamination investigations and remediation will be carried out in accordance with Policy NE5.

The site is wholly within FZ1 where residential development is acceptable in terms of fluvial flood risk.

More than 20% (20.94) is at high risk of flooding from surface water, a further 10.12% is at medium risk and a further 25.96% is at low risk.

The site will require a Level 2 SFRA to fully assess extents, depths and hazards of surface water flooding including the impact of climate change and establish whether development could be achieved safely over its lifetime and pass the Exception Test.

Development should take account of the culvert below the highway close to the southern boundary of the site.

The site is not at risk of flooding resulting from reservoir failure.

Summary assessment of alternative sites:

Outline Planning permission a wider site had been granted for 100 dwellings and the area to the east of this site developed for 58 dwellings in the first two phases. A further planning permission for 34 dwellings was granted in 2012 on this part of the site, but this permission has now lapsed. The site is entirely within Flood Zone 1 and fluvial flood risk is therefore low. Surface water flood risk is significant and extensive.

Given that residential use on the site has previously been approved, the site provides an opportunity for additional housing on brownfield land which will contribute positively to the regeneration of the area. The site is in a highly sustainable location within the urban area and currently detracts from the streetscene being in a semi derelict state. The development of modestly sized urban brownfield sites such as this helps reduce pressure for further greenfield release both within the urban area and in the countryside. The site's owner fully supports its inclusion on the Local Plan

Given the site's location within FZ1 and that other reasonable alternatives within this area of Burnley include other former industrial sites facing similar challenges in terms of surface water risk, culverts etc, or are poorer in relation to other planning considerations, the site is considered to pass the Sequential Test.

However, due to the high level of the surface water flood risk and its extent, a Level 2 SFRA has been undertaken.

Employment and Town Centre Sites: Level 1 Screening Results

Table A8b demonstrates that of the 15 sites that are proposed to be allocated for employment and/or Town Centre Uses , 11 are wholly within Flood Zone 1.

Of the remaining 4 sites:

- all sites contain land within Flood Zone 2. Three of these involve a large percentage (over 50%) One involves a small percentage (less than 1%).
- all sites contain land within Flood Zone 3a. All of these involve a small percentage (less than 5%)
- 1 site contains a small percentage of land (less than 1%) within Flood Zone 3b.

Flood Zone 1 sites

The 11 sites that fall entirely within Flood Zone 1 are considered to be at a low risk of flooding from rivers or the sea. Consequently, the principle of developing these sites for employment and or town centre uses (uses classed as 'less vulnerable') would satisfy the Sequential Test in relation to fluvial flooding. However, and in accordance with national guidance, there is a need to consider the susceptibility of sites to other sources of flood risk as, for example, a site that is located entirely within Flood Zone 1 may be prone to surface water flooding.

The majority of these 15 sites do have some susceptibility to surface water flooding. Nevertheless, the SFRA screening indicates that only 1 of the sites is considered to be at a significant risk of surface water flooding (defined as having more than 10% site area at high or medium risk and/or over 20% site area at low risk). A Sequential Test of this site has been undertaken.

Consequently, the actual level of risk associated with surface water flooding is expected to be low for most of these sites. In addition, given that only a very small percentage area of these sites are vulnerable to surface water flooding, it is probable that any employment development that takes place on these sites could be directed away from the parts of the site that are susceptible to surface water flooding.

As set out in table A8b, no sites in Flood Zone 1 are identified as being at risk of flooding associated with reservoir failure.

Flood Zone 2 sites

Sequential Test assessments for all 4 sites partially within Flood Zone 2 are set out below.

Of these 4 sites none is at significant risk of surface water flooding (defined as having more than 10% site area at high or medium risk and/or over 20% site area at low risk).

Consequently, the actual level of risk associated with surface water flooding is expected to be low for these sites. In addition, given that only a very small percentage area of these sites are vulnerable to surface water flooding, it is probable that any employment development that takes place on these sites could be directed away from the parts of the site that are susceptible to surface water flooding.

As set out in table A8b, 3 sites in Flood Zone 2 are identified as being at risk of flooding associated with reservoir failure.

Flood Zone 3a sites

Sequential Test assessments for all 4 sites partially within Flood Zone 3a are set out below.

Of these 4 sites none are at significant risk of surface water flooding (defined as having more than 10% site area at high or medium risk and/or over 20% site area at low risk).

Consequently, the actual level of risk associated with surface water flooding is expected to be low for these sites. In addition, given that only a very small percentage area of these sites are vulnerable to surface water flooding, it is probable that any employment development that takes place on these sites could be directed away from the parts of the site that are susceptible to surface water flooding.

As set out in table A8b, 3 sites in Flood Zone 3a are identified as being at risk of flooding associated with reservoir failure. Sequential Test discussion for these sites is set out below.

Flood Zone 3b sites

Sequential Test discussion for one site partially within Flood Zone 3b is set out below.

The site is not at significant risk of surface water flooding (defined as having more than 10% site area at high or medium risk and/or over 20% site area at low risk).

Consequently, the actual level of risk associated with surface water flooding is expected to be low for this sites. In addition, given that only a very small percentage area of this site is vulnerable to surface water flooding, it is probable that any employment development that takes place on this site could be directed away from the parts of the site that are susceptible to surface water flooding.

As set out in the table, this is not identified as being at risk of flooding associated with reservoir failure.

Employment and Town Centre Sites: Assessments

Assessments of all the proposed allocations that fall partly within Flood Zones 2, 3a or 3b and/or have been identified as being at significant risk of surface water flooding have been set out in order to assess the level of flood risk on these sites in more detail, to highlight the development potential of the sites and provide reasons why the allocations could not be met on other sites.

Name of Site:	**EMP1/3 Vision Park**
Level 1 Assessment ref	HEL/165
Proposed Use	Employment
Site Flood Zone	1 (47.25%), 2 (51.91%),3a (0.84%) 3b (0.00%) Main river: River Calder
Does the site lie in the functional floodplain (Zone 3b)	No
Is the proposed use acceptable in this Flood Zone?	Yes. Employment uses are generally classed as less vulnerable and are acceptable in FZ1, FZ2, and FZ3a.
Is the site considered to be at risk from other forms of flooding	Yes. EA Reservoir flood maps show the site is at risk of flooding resulting from failure of a reservoir due to the impact of such an event on the adjacent River Calder. The site is not at significant risk of surface water flooding. Less than 10% of the site area is at high or medium risk; less than 20% of the site is at low risk.
Consideration: The site is bisected by the River Calder. To the east of the river is a grassed, cleared site sloping slightly to the west. To the west of the river is open space including a disused playing pitch. Part of the eastern portion of the site (including an area within FZ2) has recently received permission for B1 use. A very small percentage of the site area is within FZ3a. Employment uses are generally less vulnerable and are compatible in this FZ. However, it is considered that risk can be effectively	

negated by incorporating the affected area into the easement required within 8m of the River Calder where an environmental permit may be required for flood risk activities.

Over 50% of the site is within Flood Zone 2 including most of the site west of the River Calder. Employment uses are generally less vulnerable and are compatible in this FZ.

The site will require a Level 2 SFRA to fully assess flood extents, depths, velocities and hazards within Flood Zones 3a and 2 including the impact of climate change and establish whether development could be achieved safely over its lifetime.

Surface water flood risk on the site is low and this risk can be effectively reduced by appropriate layout and design a sustainable drainage strategy.

EA Reservoir flood maps show the site is at risk of flooding resulting from failure of a reservoir due to the impact of such an event on the adjacent River Calder. However, due to the active management and regular maintenance of these structures, there is a very low risk of flooding and as such, this source of flooding should not be used to determine whether development should take place at an allocation site or not.

Summary assessment of alternative sites:

The Local Plan Proposed Submission Document has identified a requirement for 90 hectares of employment land across the plan period (2012-2032). The Burnley Strategic Housing and Economic Land Availability Assessment (SHLAA) 2016 assessed the amount of land within the borough with the potential to meet the identified need and demand for new employment development.

A list of the sites assessed for employment use which were identified as suitable, achievable and available (i.e. developable) is set out in the SHLAA.

The SHLAA indicated that over the plan period there is insufficient 'developable' land to provide to meet the requirement on sites outwith the current Green Belt.

In order to meet the identified requirement two Green Belt sites have been identified for allocation.

Despite flood risk constraints, the Vision Park is considered sequentially more preferable in broader planning terms to releasing further Green Belt land.

The Vision Park site is in a highly sustainable location with Burnley, with Burnley Central Station and Burnley town centre close by and has good access to the strategic road network.

Development in this location will provide employment opportunities in an area within the most deprived 10%.

Located next to the new Burnley College/ University of Central Lancashire (UCLAN) campus and in close proximity to the town centre, Vision Park will provide a unique offer to advanced manufacturing and digital industries that can connect to expertise in manufacturing and robotic technologies to foster links with UCLAN in terms of technology transfer, business support and skills development. UCLAN fully support the allocation.

There is an existing planning permission on part of the site; the site is identified in the Lancashire Strategic Economic Plan (SEP) as part of the Arc of Innovation with the potential to grow high value technology based businesses and the Lancashire LEP has invested £1.7m in site infrastructure.

The Council's Sustainability Appraisal of the site states *'Significant positive effects are likely in relation to SA objectives 2: Borough image, 3: Deprivation and 6: Sustainable transport. A significant negative effect is likely for objective 12: Built environment'.*

There are no sequentially preferable sites in terms of flood risk i.e. located within FZ1, to meet the borough's employment land requirement outwith the Green Belt and the site is therefore considered to pass the Sequential Test.

Name of Site:	**EMP1/13 Shuttleworth Mead South**
Level 1 Assessment ref	HEL/171
Proposed Use	Employment
Site Flood Zone	1 (14.11), 2 (81.86), 3a (4.03%) 3b (0.00%) Main river: River Calder
Does the site lie in the functional floodplain (Zone 3b)	No.
Is the proposed use acceptable in this Flood Zone	Yes. Employment uses are generally classed as less vulnerable and are acceptable in FZ1, FZ2, and FZ3a.
Is the site considered to be at risk from other forms of flooding	Yes. EA Reservoir flood maps show the site is at risk of flooding resulting from failure of a reservoir due to the impact of such an event on the adjacent River Calder. The site is not at significant risk of surface water flooding. Less than 10% of the site area is at high or medium risk; less than 20% of the site is at low risk.

Consideration:

The site is located on agricultural land within the Green Belt adjacent to the southern bank of the River Calder, opposite Shuttleworth Mead Business Park to the north side of the river.

A small percentage of the site area is within FZ3a. The FZ3a area lies immediately alongside the river bank. Employment uses are generally less vulnerable and are compatible in this FZ3a. It is considered that this risk can be effectively negated by appropriate layout and design e.g. by incorporating the area into landscaping, parking or the easement required within 8m of the River Calder where an environmental permit may be required for flood risk activities.

Over 80% of the site is within Flood Zone 2. Employment uses are generally less vulnerable and are compatible in this FZ2.

Although not required by the NPPF/NPPG a Level 2 SFRA has been undertaken in line with EA advice and to fully assess flood extents, depths, velocities and hazards within Flood Zones 3a and 2 including the impact of climate change and to establish whether development could be achieved safely over its lifetime.

Surface water flood risk on the site is low and this risk can be effectively reduced by appropriate layout and design a sustainable drainage strategy.

EA Reservoir flood maps show the site is at risk of flooding resulting from failure of a reservoir due to the impact of such an event on the adjacent River Calder. However, due to the active management and regular maintenance of these structures, there is a very low risk of flooding and as such, this source of flooding should not be used to determine whether development should take place at an allocation site or not.

Summary assessment of alternative sites:

The Local Plan Proposed Submission Document has identified a requirement for 90 hectares of employment land across the plan period (2012-2032). The Burnley Strategic Housing and Economic Land Availability Assessment (SHLAA) 2016 assessed the amount of land within the borough with the potential to meet the identified need and demand for new employment development.

A list of the sites assessed for employment use which were identified as suitable, achievable and available (i.e. developable) is included in the SHLAA.

The SHLAA indicated that over the plan period there is sufficient ‘developable’ land to meet the requirement on sites outwith the current Green Belt.

In order to meet the identified requirement, and allowing for a contribution from small sites below the allocation threshold, a further 23.35 hectares of employment land needed to be identified.

Three sites were therefore considered within the Green Belt, of which two were required:

- Burnley Bridge Extension
- Shuttleworth Mead South
- Blackburn Road, Padiham

All three sites are on land which justifies its inclusion within the current Green Belt but taking all planning consideration in to account, two of the sites have been proposed for allocation and the Council considers these sites could be released from the Green Belt for development without undermining its overall integrity. These are:

- Burnley Bridge Extension (EMP1/12)
- Shuttleworth Mead South (EMP1/13)

The SFRA Level 1 Screening Assessment of all potential development sites showed the Blackburn Road site to be located entirely within Flood Zone 1 and therefore at low risk of fluvial flooding. The site includes an ordinary watercourse which bisects the site running from the top of the site (Blackburn Road) to the bottom (Padiham Greenway). Approximately 14% of the site is at risk from surface water with some 7.5% at high or medium risk. The Level 1 Screening recommended that subject to submission of a site specific Flood Risk Assessment (FRA) to support any planning application there were no flood risk grounds to prevent development. Surface water issues/ordinary watercourse could be adequately addressed through the FRA.

In flood risk terms, the Blackburn Road, Padiham and Burnley Bridge Extension sites are sequentially preferable to Shuttleworth Mead South. Burnley Bridge Extension is proposed to be allocated so the only site sequentially preferable to Shuttleworth Mead South in flood risk terms is the site at Blackburn Road, Padiham.

Comparison of Shuttleworth Mead South and Blackburn Road

Location – Both sites are located to the west of the borough, are well related to the Tier 1 and 2 settlements of Burnley and Padiham and have good access to the strategic road network.

Highways impact – Blackburn Road already takes traffic from the existing Shuttleworth Mead Business Park. No information has been provided by the landowner of the Blackburn Road site as to where the access to the site would be. An additional access point onto Blackburn Road from the Blackburn Road site may negatively impact on the highway network. The Shuttleworth Mead South site has two potential points of access, one via the existing Shuttleworth Mead Business Park, and another directly onto the A6068, and the latter access would allow much of the site's traffic to avoid the Blackburn Road/A6068 junction.

Padiham Greenway – The Padiham Greenway is a valued community asset. A number of Local Plan consultees stated in their objections that any development of the Blackburn Road site would negatively impact on the recently developed Padiham Greenway, in relation to its setting and use. Both sites would benefit from their proximity to the Greenway.

Topography of site – the Shuttleworth Mead South site is relatively flat and low lying and would be more fexi8sbl in term of the types of industrial buildings it could accommodate. The Blackburn Road site is at a higher elevation and has a sloping and undulating topography. The topography of the Blackburn Road site is such that it is likely to require significant excavation works.

Landscape Impact – The Blackburn Road site sits in a more elevated position and its development will have a greater and wider impact on the landscape. The Blackburn Road site retains a number of hedgerows and hedgerow trees a number or which are likely o be lost, some of which may have protection under the Hedgerows Regulations 1997. The Shuttleworth Mead South site retains fewer hedgerow and trees and contains large electricity pylons and power lines which already compromise

its landscape quality.

Residential amenity – the Blackburn Road site is both immediately adjacent to and opposite a number of residential properties and development on this site would have a greater impact on residential amenity than the Shuttleworth Mead South site which is not. The nature of the proposed site uses, B2 and B8, with potential traffic vehicle movements 24 hrs per day together with noise from extraction and industrial lighting would have an impact on the residential amenity of neighbouring properties and would therefore require buffering and landscaping which particularly when taken into account with its topography, would reduce its developable area and restrict the scale of buildings possible.

Locally listed Stirkin Farm – the Blackburn Road site contains an existing farm which is locally listed. If this heritage asset was to be retained and its setting protected to an appropriate degree, this would further reduce the site's developable area. A wildlife survey stated that bats may be present in the farm and barn.

Traffic impact on Blackburn Road – No information has been provided by the landowner of the Blackburn Road site as to where the access to the site would be but it is likle to be form a new access point on to Blackburn. Access to the Shuttleworth Mead South site could either be via the existing Shuttleworth Mead junction on Blackburn Road and a bridge to the south of the existing business park or directly off the A6068, or both.

Sustainability Appraisal (SA) – the SA conducted on behalf of Burnley BC for the Local Plan Proposed Submission document did not assess Blackburn Road as it was not determined to be a reasonable alternative in the SHLAA (as it is within the Green Belt). However, an early version of the SA Report produces alongside the Issues & Options plan looked at both sites. A summary of the SA results indicated that:

Blackburn Road - The likely effects of development are mixed. There would be positive effects on the economy and image, with significant effects on transport and access to jobs. Negative effects on environmental quality and climate change adaptation would be likely, with significant negative effects on landscape and possibly biodiversity and built heritage. Mitigation would need to be identified if the site was taken forward.

Shuttleworth Mead South (previously known as Eaves Barn Farm): The likely effects of development are mixed. There would be positive effects on the economy and image, with significant effects on transport and access to jobs. Negative effects on environmental quality and climate change adaptation (especially flood risk which is possibly significant) would be likely, with significant negative effects on landscape and possibly biodiversity and built heritage. Mitigation would need to be identified if the site was taken forward.

While the Blackburn Road site would be sequentially preferable in terms of flood risk i.e. it is located within FZ1, in terms of site suitability and sustainability as a whole, Shuttleworth Mead South is considered to bring greater benefits in terms of its offer and its reduced development impacts and in such circumstances the Blackburn Road Site, being in the Green Belt, is not considered to be a 'reasonable alternative' site, and given the lack of other reasonable alternatives, the Shuttleworth Mead South site is considered to pass the Sequential Test.

Name of Site:	**EMP1/5 Land south of Network 65**
Level 1 Assessment ref	HEL/189
Proposed Use	Employment
Site Flood Zone	1 (98.91%) 2 (0.46%), 3a (0.12%), 3b (0.52%) River: Hapton Clough
Does the site lie in the functional floodplain (Zone 3b)	Yes . A very small area of the site is within Zone 3b.

Is the proposed use acceptable in this Flood Zone	Yes , except very small area within Zone 3b.
Is the site considered to be at risk from other forms of flooding	No. The site is at low risk from surface water flooding. Less than 5 % of the site area is at high, medium or low risk. The site is not at risk from flooding resulting from reservoir failure.

Consideration:

The site is located on agricultural land outside the Green Belt close to Network 65 Business Park.

A small percentage of the site area is within FZ3b, FZ3a and FZ2. Employment uses proposed are considered to be less vulnerable and are compatible in FZ3a and FZ2, but not in FZ3b. However, it is considered that this risk in all these zones can be effectively negated by appropriate layout and design e.g. by incorporating the affected area into landscaping or parking areas.

Surface water flood risk on the site is low and this risk can be effectively reduced by appropriate layout and design a sustainable drainage strategy.

EA Reservoir flood maps show the site is at risk of flooding resulting from failure of a reservoir due to the impact of such an event on the adjacent River Calder. However, due to the active management and regular maintenance of these structures, there is a very low risk of flooding and as such, this source of flooding should not be used to determine whether development should take place at an allocation site or not.

Given the very small percentage of the site outside FZ1, and the low risk of flooding from other sources, it is considered that site layout, design and sustainable drainage strategy can effectively negate flood risk on this site.

Summary assessment of alternative sites:

The Local Plan Proposed Submission Document has identified a requirement for 90 hectares of employment land across the plan period (2012-2032). The Burnley Strategic Housing and Economic Land Availability Assessment (SHLAA) 2016 assessed the amount of land within the borough with the potential to meet the identified need and demand for new employment development.

The SHLAA indicates that over the plan period there is insufficient 'developable' land to meet the requirement on sites outwith the current Green Belt.

Given the lack of alternative sites outwith the Green Belt and the fact that a sequential approach can be taken within the site to mitigate flood risk, the site is considered to pass the Sequential Test.

Name of Site:	**EMP1/8 Thompson Centre**
Level 1 Assessment ref	HEL/189
Proposed Use	Employment or Town Centre (less vulnerable uses only)
Site Flood Zone	1 (100%)
Does the site lie in the functional floodplain (Zone 3b)	No
Is the proposed use acceptable in this Flood Zone	Yes
Is the site considered to be at risk from other forms of flooding	Yes . More than 10% (36.51%) of the site area is at medium risk of flooding from surface water. Further, more than 20% of the site area (56.99%) is at low risk.

Consideration:

This is a flat, surfaced site currently used as a car park. The main part is raised above a small landscaped area and the adjacent roadway to the north and east but sites at a lower level than the

land to the south.

The site is prominently located at a Key Gateway into Burnley town centre at the edge of the Conservation Area adjacent to a cluster of listed buildings.

A culverted section of the River Calder crosses the southern boundary of the site and it is likely an Environmental Permit for flood risk activities would be required. However, the site is entirely within FZ1 and fluvial flood risk is low.

Surface water flood risk on the site is significant and extensive, affecting the majority of the site. The site will require a Level 2 SFRA to fully assess extents, depths and hazards of surface water flooding including the impact of climate change and establish whether development could be achieved safely over its lifetime.

EA Reservoir flood maps show the site is not at risk of flooding resulting from failure of a reservoir.

Summary assessment of alternative sites:

The site is a brownfield site in Burnley Town Centre currently in use as a car park and is located in a highly sustainable location directly adjacent to Burnley bus station within walking distance of two railway stations. Given its Town Centre location outwith the primary shopping area it is sequentially preferable for town centre non retail uses, including B1a office, in line with national planning policy.

There are few reasonable alternative sites to accommodate B1a uses in the Town Centre. One alternative site at Curzon Street is proposed to be allocated to accommodate the Plan's identified retail requirement being better related to the current Primary Shopping Area than this site. The Curzon Street site is not sequentially preferable in flood risk terms, being large located within FZ2.

The other reasonable alternative, Parker Lane/Croft Street, located close to the Thompson Centre site in Burnley Town Centre is not currently available for redevelopment and is partly in retail use.

The site has capacity to accommodate up to 5,800sq m of B1a office space and development will provide opportunities for additional planting/SUDS. The Sustainability Appraisal states '*Significant positive effects are likely in relation to SA objectives 2: Borough image, 3: Deprivation and 6: Sustainable transport. A significant negative effect is likely for objective 12: Built environment'.*

Given its prominent Town Centre location and the lack of reasonable alternative sites to accommodate B1a office use at a lower risk of flooding, the site is considered to pass the Sequential Test.

Name of Site:	**TC4/1 Curzon Street**
Level 1 Assessment ref	TC4/1
Proposed Use	Town Centre (including A4 uses)
Site Flood Zone	1 (33.14), 2 (64.05%), 3a (2.81%) 3b (0.00%)
Does the site lie in the functional floodplain (Zone 3b)	No
Is the proposed use acceptable in this Flood Zone	Generally town centre uses are classed as less vulnerable and would therefore be compatible in FZ2 and 3a. However, A4 uses including drinking establishments, which are proposed on this site, are classed as more vulnerable and in FZ3a would require the Exception Test to be passed.
Is the site considered to be at risk from other forms of flooding	No. Less than 5% of the site area is at high or medium risk of flooding from surface water. Less than 10% of the site (9.34) is at low risk.

Consideration:

This is a vacant previously developed site located on a Key Gateway within Burnley Town Centre. Part of the site is currently in use as a car park.

The River Brun crosses the site both as an open watercourse and in culvert. Development proposals will be required to explore deculverting the covered section of river which may offer benefits in terms of reduced flood risk in addition to ecological and amenity benefits. Proposals will need to take account of the easement requirements of the Environment Agency to provide unobstructed access to the watercourse for inspection and maintenance.

A small percentage of the site area immediately adjacent to the River Calder is within FZ3a. Town centre uses are considered less vulnerable and are compatible in FZ3a, except for A4 uses which are more vulnerable. More vulnerable uses in FZ3a would need to pass the Exception Test to be acceptable.

Over 60% of the site is within Flood Zone 2. Employment uses (both less vulnerable and more vulnerable) are compatible in this FZ.

The site will require a Level 2 SFRA to fully assess flood extents, depths, velocities and hazards within Flood Zones 3a and 2 including the impact of climate change and if necessary pass the Exception Test.

Surface water flood risk on the site is low. It is considered that this risk can be effectively mitigated by appropriate layout and design and a sustainable drainage strategy.

EA Reservoir flood maps show the site is at risk of flooding resulting from failure of a reservoir due to the impact of such an event on the adjacent River Calder. However, due to the active management and regular maintenance of these structures, there is a very low risk of flooding and as such, this source of flooding should not be used to determine whether development should take place at an allocation site or not.

Summary assessment of alternative sites:

This is a brownfield site located within the Town Centre on the edge of the Primary Shopping Area and has been identified as the site to meet the identified retail requirement. The site is considered suitable for a mix of other town centre uses, including office and leisure uses.

There are few other developable town centre sites. The Thompson Centre site, which would be marginally sequentially preferable in terms of flood risk i.e. located within FZ1 but subject to surface water flooding issues, is not as well located to the current primary shopping area and is in any case identified for allocation for B1a office use to meet the borough's employment land requirement.

Given its prominent Town Centre location, its strong relationship to the existing shopping centre and the lack of reasonable alternative sites at a lower risk of flooding, the site is considered to pass the Sequential Test.

Table A8a: Level 1 SFRA Results for Proposed Housing Allocations

Site reference	Site name	Site area (ha)	Flood Zone Classification (% area within zone)				Vulnerability classification	Risk of Surface Water Flooding		Is the site known to be at risk of flooding from a reservoir
			1	2	3a	3b		Over 10% of site at high or medium risk?	Over 20% at low risk?	
HS1/1	Former Hameldon Schools Sites	10.10	99.96	0.02	0.02	0.00	More vulnerable	No	No	No
HS1/2	Hollins Cross Farm	8.65	100.00				More vulnerable	No	No	No
HS1/31.27	Former William Blythe Site	6.00	100.00				More vulnerable	Yes	No	No
HS1/4	Land at Rossendale Road (housing)	7.52	100.00				More vulnerable	No	No	No
HS1/5	Former Baxi Site	8.23	26.70	9.00	63.12	1.17	More vulnerable	No	No	Yes
HS1/6	Lambert Howarth	2.99	100.00				More vulnerable	No	No	No
HS1/7	Ridge Wood	0.87	100.00				More vulnerable	No	No	No
HS1/9	Red Lees Road, Cliviger	5.00	100.00				More vulnerable	No	No	No
HS1/10	Higher Saxifield	5.17	100.00				More vulnerable	No	No	No
HS1/11	Land at Burnley General Hospital	1.27	100.00				More vulnerable	No	No	No
HS1/12	Former AIT Site	1.81	100.00				More vulnerable	No	No	No
HS1/13	Peel Mill (housing)	2.02	100.00				More vulnerable	No	No	No
HS1/14	Waterside Mill	2.76	95.03	1.07	0.00	3.90	More vulnerable	No	No	No
HS1/15	Former Heckenhurst Reservoir	1.38	100.00				More vulnerable	No	No	No
HS1/16	Tay Street	1.18	100.00				More vulnerable	No	No	No
HS1/17	Former Gardner Site	1.43	100.00				More vulnerable	No	Yes	No
HS1/18	Former Ridgewood High School	3.42	100.00				More vulnerable	No	No	No
HS1/19	Coronation Avenue, Thompson Street	0.90	100.00				More vulnerable	No	No	No
HS1/20	Gordon Street Mill	1.41	100.00				More vulnerable	No	No	No
HS1/21	Livingstone Mill	0.95	100.00				More vulnerable	No	No	No
HS1/23	Perseverance Mill, Padiham	1.18	30.49	68.91	0.60	0.00	More vulnerable	Yes	Yes	No
HS1/24	Land NE of Sycamore Avenue	0.77	100.00				More vulnerable	Yes	Yes	No

HS1/25	Ridge Avenue	1.46	100.00				More vulnerable	No	No	No
HS1/26	Land adjacent 2 Queens Park Road	0.95	100.00				More vulnerable	No	No	No
HS1/27	Former Dexter Paints	0.83	100.00				More vulnerable	No	No	No
HS1/28	Land to rear of Bull and Butcher	0.95	100.00				More vulnerable	No	No	No
HS1/29	Land at Oswald Street	0.60	100.00				More vulnerable	No	No	No
HS1/30	Brampton House, 500 Colne Road	0.64	100.00				More vulnerable	Yes	Yes	No
HS1/31	Land adjacent 250 Brownside Road	0.73	100.00				More vulnerable	No	No	No
HS1/32	Clevelands Road (South)	0.42	100.00				More vulnerable	No	No	No
HS1/34	George Street Mill (EMP1/11)	0.98	100.00				More vulnerable	No	No	No
HS1/35	Lodge Mill, Barden Lane	2.32	100.00				More vulnerable	No	No	No
HS1/36	Land West of Smithyfield Avenue	1.72	100.00				More vulnerable	No	No	No
HS1/37	Barden Mill, Barden Lane	0.85	100.00				More vulnerable	No	No	No
HS1/39	Butchers Farm	1.17	100.00				More vulnerable	No	No	No

Table A8b: Level 1 SFRA Results for Proposed Employment Allocations

Site reference	Site name	Site area (ha)	Flood Zone Classification				Vulnerability classification	Risk of surface water flooding		Is the site known to be at risk of flooding from a reservoir
			1	2	3a	3b		Over 10% of site at high or medium risk?	Over 20% at low risk?	
EMP1/1	Rossendale Road (North)	4.65	100.00				Less Vulnerable	No	No	No
EMP1/2	Burnley Bridge Business Park	6.56	100.00				Less Vulnerable	No	No	No
EMP1/3	Vision Park	5.05	47.25	51.91	0.84	0.00	Less Vulnerable	No	No	Yes
EMP1/4	Widow Hill Road	2.17	100.00				Less Vulnerable	No	No	No
EMP1/5	Land South of Network 65	13.32	98.91	0.46	0.12	0.52	Less Vulnerable	No	No	No
EMP1/6	Balderstone Lane	2.12	100.00				Less Vulnerable	No	No	No
EMP1/7	Westgate	1.80	100.00				Less Vulnerable	No	No	No
EMP1/8	Thompson Centre Car Park (Mixed Use)	0.65	100.00				Less Vulnerable	Yes	Yes	No
EMP1/9	Innovation Drive	0.97	100.00				Less Vulnerable	No	No	No

Site reference	Site name	Site area (ha)	Flood Zone Classification				Vulnerability classification	Risk of surface water flooding		Is the site known to be at risk of flooding from a reservoir
			1	2	3a	3b		Over 10% of site at high or medium risk?	Over 20% at low risk?	
EMP1/10	Widow Hill Rd South	0.63	100.00				Less Vulnerable	No	No	No
EMP1/11	George St Mill (Mixed Use)	0.93	100.00				Less Vulnerable	No	No	No
EMP1/12	Burnley Bridge Extension	10.27	100.00				Less Vulnerable	No	No	No
EMP1/13	Shuttleworth Mead South (aka Eaves Barn Farm, Padiham)	9.27	14.11	81.86	4.03	0.00	Less Vulnerable	No	No	Yes
EMP1/14	Stoneyholme Gas Works	0.5	100.00				Less Vulnerable	No	No	No
TC1/4	Curzon Street	1.65	33.14	64.05	2.81	0.00	More vulnerable (may involve A4 uses)	No	No	Yes

Appendix 9: Site specific Flood Risk Assessments (FRAs)

The Level 1 Sites Assessment (Appendix 2) provides details of those sites which would require a site specific FRA if developed.

The Level 2 SFRA will provide greater detail of what will be required in an FRA for those proposed Local Plan allocations under detailed assessment.

In general FRAs should be proportionate to the degree of flood risk and to the scale, nature and location of the proposed development.

Planning Practice Guidance Flood Risk and Coastal Change sets out the requirements for site specific Flood Risk Assessments (FRAs) and provides a checklist for developers (para 26).

Further information is available from the Government's Standing Advice for planning applicants and agents:

https://www.gov.uk/guidance/flood-risk-assessment-standing-advice

Appendix 10: References and information sources

Burnley Borough Council (TEP consultants) (2013), Burnley Green Infrastructure Strategy.

Burnley Borough Council (2006) Burnley Local Plan Second Review

CIRIA (2015) SUDS Manual C753

DEFRA (2009) UK Climate Projections UKCP09

Department of Communities and Local Government (2016) Planning Policy Guidance, Flood Risk and Coastal Change.

Department of Communities and Local Government (2012) National Planning Policy Framework

EC Water Framework Directive 2000/60/EC

EC Floods Directive 2007/60/EC

Environment Agency (2016) Flood Map for Planning (Rivers and Sea)

Environment Agency (2016) Risk of Flooding from Surface Water

Environment Agency (2016) Guidance- Flood Risk Assessments: Climate Change Allowances

Environment Agency (2011) Burnley Nelson and Colne Flood Risk Management Strategy

Environment Agency (2009) North West River Basin Management Plan

Environment Agency (2009) Managing Flood Risk: River Ribble Catchment Flood Management Plan Final Report March January 2009.

Flood Risk Regulations 2009, TSO

Flood and Water Management Act 2010, TSO

JBA Consulting for Burnley Borough Council, (2017) Strategic Flood Risk Assessment (SFRA) Level 1 site screening assessment;

JBA Consulting for Burnley Borough Council, (2017) Strategic Flood Risk Assessment (SFRA) Level 1 site screening Summary report

JBA Consulting for Burnley Borough Council, (2017) Strategic Flood Risk Assessment (SFRA) Level 1 SFRA mapping.

Lancashire County Council (2016) Burnley District Flood Report: Recommended Actions, November 2016.

Lancashire County Council (2016) December 2015 Floods in Lancashire: Flood and Water Management Act 2010. Section 19 Investigation, October 2016

Lancashire County Council and Blackpool District Council (2014) Lancashire Flood Risk Management Strategy 2014-2017

Lancashire County Council (2011) Preliminary Flood Risk Assessment (PFRA) June 2011

United Utilities (2009) Water Resources Management Plan. September 2009.

Sustainable Drainage Systems: Useful information sources:

www.susdrain.org
http://www.rspb.org.uk/Images/SuDS_report_final_tcm9-338064.pdf

Appendix 11: Planning Policy Context

European

The EU Water Framework Directive 2000/60/EC

The Directive promotes an integrated approach to water focusing on improving water quality and the protection of aquatic ecosystems whilst also contributing to mitigating the effects of floods and droughts and promoting sustainable use of water as a natural resource. The Directive requires Member States to establish river basin districts and for each of these a river basin management plan.

See North West River Basin Management Plan below.

EU Floods Directive 2007/60/EC

This Directive now requires Member States to assess if all watercourses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk. This Directive also reinforces the rights of the public to access this information and to have a say in the planning process.

National

Making Space for Water 2004

The Government's 20 year strategy and programme for flood and coastal erosion risk management in England. The strategy aims to implement a holistic approach to managing flood and coastal erosion risks in England. The approach will involve taking account of all sources of flooding, embedding flood management across a range of Government policies, and reflecting other relevant Government policies in the policies and operations of flood and coastal erosion risk management. The aim will be to manage risks by employing an integrated portfolio of approaches which reflect both national and local priorities, so as to reduce the threat to people and their property; and deliver the greatest environmental, social and economic benefit, consistent with the Government's sustainable development principles.

In Burnley the strategy is progressed through the local *Making Space for Water group* which involves the Council's planning (policy and development control), emergency planning and drainage functions along with the Environment Agency, United Utilities and Lancashire County Counci with a view to developing integrated multi-agency partnership working in water management at the district level. The group's remit is to: provide accurate assessments of the risk, nature and scale of local flooding identify and bring forward solutions to reduce the risk of flooding from local sources; investigate and mitigate the effects of flooding incidents.

Future Water 2008

This Water Strategy for England considers every aspect of water use and management in the context of climate change and addresses flood risk arising from surface water run off and sewer capacity.

National Planning Policy Framework 2012

National Planning Policy Framework was published in March 2012. It replaced a suite of Planning Policy Statements including PPS25 *Development and Flood Risk.* Section 10 of the NPPF *Meeting the challenge of climate change, flooding and coastal change* sets out the Government's key objectives in this policy area.

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Local Plans should be supported by Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as lead local flood

authorities and internal drainage boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid where possible flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by:

- applying the Sequential Test;
- if necessary, applying the Exception Test;
- safeguarding land from development that is required for current and future flood management;
- using opportunities offered by new development to reduce the causes and impacts of flooding;
- and where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations.

Planning Practice Guidance on Flood Risk and Coastal Change

This guidance provides further more detailed advice on how the approach set out in the NPPF should be applied both at strategic level in local plan making and in terms of individual planning applications. The guidance dates mainly from 2014 with supplementary advice on sustainable drainage systems, permitted development, development safety and flood resilience and resistance being added in 2015.

Flood Risk Regulations 2009

These regulations implement the EU Floods Directive in England and Wales. Under the regulations county and unitary councils are designated as 'Lead Local Flood Authorities'. Such authorities now have duties to:

- Carry out a preliminary assessment of 'local flood risk', which means considering all sources of flooding (not including that from main rivers, the sea and reservoirs unless they affect local flood risk) by June 2011.
- On the basis of this assessment, identify Flood Risk Areas, which are areas of significant risk, taking into account local sources of flood risk and having regard to national thresholds and Environment Agency Guidance by June 2011;
- Prepare maps showing the level of hazard and risk in Flood Risk Areas by June 2013, and
- Prepare management plans for these Flood Risk Areas by June 2015.

Flood and Water Management Act 2010

This major piece of legislation has been created in response to the Pitt Review of the 2007 summer floods that devastated large areas of England.

The main implications for our area are as follows:

- Lancashire County Council (LCC) will be the Lead Local Flood Authority, responsible for the co-ordination of flood risk management across its area. The Act will permit some delegation of functions between "risk management authorities", which includes water companies, the EA and district councils.
- All the above organisations will have a duty to co-operate, and to provide information to the County Council for flood risk management purposes as necessary. There is an expectation that the County Council will develop partnership with these organisations in delivering flood risk management.

- The County Council will have a duty to develop, maintain, apply, monitor and consult on a Local Flood Risk Management Strategy for its area. Local flood risk includes surface runoff, groundwater, and ordinary watercourses (including lakes and ponds).
- The County Council will have a duty to ensure that the strategy is consistent with the national strategy to be developed by the EA.
- The County Council will have a duty to ensure that flooding incidents in its area are investigated, and that intended actions are identified and published.
- The County Council will have a duty to maintain a register of structures or features which might impact on flood risk, including ownership details and condition. The register must be available for inspection.
- County Council Overview & Scrutiny Committees will be empowered to hold all risk management organisations in their area to account.
- The County Council will have powers to undertake works for managing flood risk from surface runoff or groundwater.

The County Council will have powers to designate structures or features as affecting flooding, including those on private land. Designation would mean the owner would need LCC consent before making any changes, and LCC would have powers of enforcement action.

- The County Council will act as a Sustainable Urban Drainage System (SuDS) Approval Body for new developments or redevelopments, to work in tandem with the planning system. In this capacity, LCC would have to adopt and maintain those SuDS serving more than one property.
- The County Council will have a duty to contribute to sustainable development in carrying out its flood risk management functions.
- The County Council will be responsible for developing a generic off-site emergency plan for large reservoirs (81 in Lancashire), and location specific plans for 11 reservoirs deemed at the highest risk.

Sub Regional

Ribble Catchment Flood Management Plan 2009

Catchment Flood Management Plans are produced by the Environment Agency to assess the scale and extent of flooding within catchments both now and in the future. The Ribble CFMP informs planning and decision making by the EA, local planning bodies, utilities, landowners, businesses and the public in the catchment and aims to promote more sustainable approaches to managing flood risk.

Water Company Asset Management Plans (AMP)

These have an important role in addressing particularly surface water and sewer flooding in the region. United Utilities investment is guided by five year AMPs, currently AMP 5 2010-2015. The Environment Agency is the environmental regulator for the water industry. It analyses, inform and advise on its environmental performance in delivering existing environmental requirements. Environmental requirements are established through the water companies' Asset Management Plans, and this is one part of a periodic review process.

Preliminary Flood Risk Assessment (PFRA) 2011

This was completed in 2011 by Lancashire County Council as lead local flood authority under the Flood and Water Management Act 2010. The Assessment focuses on flood risk from surface water, groundwater and ordinary watercourses It seeks to identify any areas of ‘significant’ flood risk from these sources (none with 30,000 people at risk identified in the County). The PFRA also establishes ‘Locally agreed surface water information’ for the Borough derived from EA’s Flood Map for Surface

Water. All the information collected for the PFRA will be used by LCC to inform the development of a Local Flood Risk Management Strategy.

Draft Burnley Nelson and Colne Flood Risk Management Strategy, 2010

This strategy was produced as a recommendation of the Ribble CFMP. This consultation document summarises the work carried out by the Environment Agency to investigate and manage flood risk from main rivers in the Burnley, Nelson, Padiham, Colne and Trawden areas. The aim is to reduce the impacts of flooding in these areas by maintaining and improving flood defences, enhancing flood warning and forecasting ability, influencing development planning and promoting flood proofing measures in homes.

For the purposes of this document, the area has been divided into 17 separate sub-areas, known as 'flood risk reaches.' Individual fact sheets have also been produced with more detail about each of these reaches. Copies of these are at Appendix 4.

Lancashire and Blackpool Flood Risk Management Strategy 2014-2017

The strategy outlines the duties and responsibilities of flood risk agencies including emergency planning functions; assesses existing and future local flood risk in the county and sets out a Local Flood Risk Management Plan with short and medium term strategic objectives. In order to understand local flood risk in more detail, a number of studies were undertaken to support the Local Strategy including a sub-regional Preliminary Flood Risk Assessment, followed by lower level Surface Water Management Plans and Ordinary Watercourse Studies. These studies are aimed at achieving a greater level of understanding around the main areas of risk across the region so that risk monitoring, further studies and works to reduce flood risk can be prioritised.

Local

Burnley's Local Plan

Adopted in April 2006, policy E8 of the current Burnley Local Plan (Second Review) covers Development and Flood Risk (see below). The Council is currently preparing a new Local Plan with Proposed Submission consultation scheduled for April 2017. An Infrastructure Delivery Plan is being developed alongside the Local Plan. The SFRA will form part of the Local Plan's evidence base and will inform the development of sustainability objectives and sustainability appraisal of LDF documents.

Policy E8 – Development and Flood Risk

Development will not be permitted if:

(a) it would increase the risk of flooding:
(i) by reducing the capacity of, or increasing flows within a flood plain; or
(ii) through discharge of additional surface water; or
(iii) by harming flood defences.
(b) it would be at risk itself from flooding;
(c) adequate provision is not made for access to watercourses for maintenance; and (d) the proposal does not include adequate flood protection measures.

A Flood Risk Assessment will be required where it is considered that there would be an increased risk of flooding as a result of development, or the development would be at risk of flooding.

Policy GP3 Design and Quality of the Burnley Local Plan includes 'use of Sustainable Drainage Systems' as one of criteria against which applications are to be assessed.

Flood Risk Assessment

Current Design Guidance Supplementary Planning Documents SPDs (2006) prepared for the Burnley Wood, Daneshouse, Duke Bar and Stoneyholme and South West Burnley areas of the Borough encourage the use of SuDS in new development (Guideline RE3).

Burnley Green Infrastructure (GI) Strategy 2013

Part of the evidence base for the emerging Burnley Local Plan, this Strategy analysed a range of GI functions within the borough including the role of GI in managing water resources, alleviating flood risk, mitigating and adapting to climate change. Mapping of existing functionality and areas of need identified areas to protect, enhance and create GI for these functions.

Appendix 12: Historical Flood Incidents in Burnley

December 2015 Floods

Source: Lancashire County Council (2016) ***December 2015 Floods in Lancashire Flood and Water Management Act 2010 Section 19 Investigation, October 2016***

Category	Details
Community name	Burnley (Brunshaw Area)
District	Burnley
Community reference number	MSFW253
Details of the flood event	3 properties are known to have suffered from internal flooding at this location on 26th December 2015, however there is currently only limited information available regarding the cause and source of this event.

Category	Details
Community name	Burnley (Clow Bridge Area)
District	Burnley
Community reference number	MSFW307
Details of the flood event	5 properties are known to have suffered from internal flooding at this location on 26th December 2015, however there is currently only limited information available regarding the cause and source of this event.

Category	Details
Community name	Burnley (Ightenhill Area)
District	Burnley
Community reference number	MSFW326
Details of the flood event	Details of the flood event: 1 property is known to have suffered from internal flooding at this location on 26th December 2015, however there is currently only limited information available regarding the cause and source of this event.

Category	Details
Community name	Burnley (Rose Hill Area)
District	Burnley
Community reference number	MSFW252
Details of the flood event	1 property is known to have suffered from internal flooding at this location on 26th December 2015, however there is currently only limited information available regarding the cause and source of this event.

Category	Details
Community name	Burnley (Town Centre)
District	Burnley
Community reference number	MSFW325
Details of the flood event	6 properties are known to have suffered from internal flooding at this location on 26th December 2015, however there is currently only limited information available regarding the cause and source of this event.

Category	Details
Community name	Heasandford
District	Burnley
Community reference number	MSFW324
Details of the flood event	1 commercial property is known to have suffered from internal flooding at this location on 26th December 2015, however there is currently only limited information available regarding the cause and source of this event.

Category	Details
Community name	Mereclough
District	Burnley
Community reference number	MSFW89
Details of the flood event	8 properties are known to have suffered from internal flooding at this location on 26th December 2015, however there is currently only limited information available regarding the cause and source of this event.

Category	Details
Community name	Padiham
District	Burnley
Community reference number	MSFW151
Details of the flood event	147 properties are known to have suffered from internal flooding at this location on 26th December 2015. This includes both residential and commercial properties, as well as critical infrastructure such as a police station, fire station, medical centre and a hospice. Preliminary reports indicate that the primary source of flooding was the River Calder which overtopped its banks, however some properties were also affected by the River Green Brook.

Category	Details
Community name	Worsthorne
District	Burnley
Community reference number	MSFW88
Details of the flood event	8 properties are known to have suffered from internal flooding at this location on 26th December 2015, however there is currently only limited information available regarding the cause and source of this event.

Previous flood incidents :

Source: Burnley Reference Library

Date	Event
1704	Flood of River Brun
August 1848	Floods, small paper boy falls into river
January 1852	Flood in Burnley area
August 1860	Largest flood in Burnley for 30 years
October 1866	Severe flood damage to surrounding districts of Burnley
July 1870	Destructive flooding in Burnley, Bacup and Todmorden
March 1877	Heavy rains in Burnley cause flooding of several houses off Bridge Street due to overflow of Calder
1878	Flood pictured in Burnley Express 6/4 1935
January 1880	Flooding of River Brun
July 1881	Terrible thunderstorm and floods in Burnley. About £10,000 of damage done in Burnley neighbourhood
November 1901	Flooding in Burnley, Nelson, Clitheroe and Todmorden
May 1911	Heavy thunderstorm causes flooding and widespread damage throughout Burnley area
June 1914	Thunderstorms cause severe floods in Burnley.
February 1920	Heavy rain in Burnley. Serious floods in the district. Extraordinary flooding. Highest rainfall recorded since November 1901.
December 1921	Severe floods in Burnley. Rivers in torrent. Severe rainfall.
November 1923	Flood scenes at Burnley
November 1927	Flood scenes in Fulledge
1928	Flood damage at Padiham caused by heavy rainfall
May 1930	Property flooded by downpour.
July 1930	Brun in Thompson Park
November 1931	Flood scenes in Brunshaw. Unprecedented flood scenes in the Fulledge district.
July 1932	River in spate
December 1936	Weekend gale and flood – amazing scenes in Burnley and District
October 1938	Floods on site of Towneley School. 48 hour deluge
September 1946	Heavy downpour brings most severe flooding for many years.
August 1950	Trail of havoc after worst floods for years in the Burnley district. Wettest summer on record 19.231 inches of rain in July, August and September
August 1952	Local flooding
July 1955	Floods invade houses in Cliviger Valley
October 1958	Worsthorne area
July 1964	15 minute flash flood causes £5m worth of damage to Greater Burnley area
December 1964	Floods close part of Todmorden Road, Burnley, invading homes and ripping up gardens. Flood waters halt work at Hapton Valley Colliery

December 1965	Rising River Calder
August 1967	Considerable flooding in Burnley after heavy storm
July 1972	Bad flooding in Lane Head area
October 1977	Flooding in Burnley
February 1978	The Leeds and Liverpool Canal bursts its banks
June 1980	Torrential downpour and flooding
October 1980	Torrential rain and floods hit Cliviger
August 1982	Houses in Cliviger hit by torrents of floodwater after storms
August 1986	Floods at mail sorting office and Barden Junior School
June 1988	Water main bursts and floods part of Fulledge
June 2002	Floods

Appendix 13: Roles, responsibilities and contacts of Risk Management Authorities for flooding in Burnley

Roles and responsibilities	Lancashire County Council	Environment Agency	United Utilities	District and borough Councils
	Are the Lead Local Flood Authority (LLFA) for their administrative area	Strategic overview role	Manages flood risk from sewers and reservoirs	Retain existing powers to undertake works on ordinary watercourses and powers to designate structures and features that affect flooding or coastal erosion Responsibility for strategic flood risk assessment within their boroughs to inform the planning process.
Main river flooding		√		
Coastal flooding		√		
Surface water flooding	√			
Groundwater flooding	√			
Highway flooding	√			
Ordinary watercourses	√			
Flooding from sewers			√	
Reservoirs	√	√	√	
Contact	0800 123 6780 (Highways)	0845 988 1188	0845 746 2200 United Utilities	See below
Burnley Borough Council contacts				
Planning: Policy Elizabeth Murphy, Planning Policy Manager 01282 477286 emurphy@burnley.gov.uk				
Planning: Development Management Graeme Thorpe, Development Management Manager 01282 477285 gthorpe@burnley.gov.uk				
Streetscene (Drainage) Joanne Swift, Head of Streetscene 01282 477301 jswift@burnley.gov.uk				