

Copeland Borough Council Strategic Flood Risk Assessment (SFRA)

August 2007



Copeland Borough Council
The Copeland Centre
Catherine Street
Whitehaven
Cumbria
CA28 7SJ

EXECUTIVE SUMMARY

Introduction

1. A significant proportion of the urban areas within Copeland are situated in close proximity to the coast and the large rivers of the Borough, and these areas are consequently at risk of flooding. However, these are not the only flood risks. There are many locations that are threatened by flooding from the numerous small watercourses that are feature of the upland and rural nature of Copeland, and from overloaded drainage and sewage systems.
2. The Council is currently preparing a Local Development Framework (LDF) in accordance with the Planning and Compulsory Purchase Act 2004. This Strategic Flood Risk Assessment (SFRA) will be used to inform planning related decisions for areas of Copeland *outside of the Lake District National Parks*.

Why carry out a Strategic Flood Risk Assessment (SFRA)?

3. Flooding can result not only in costly damage to property, but can also pose a risk to life and livelihood. It is essential that future development is planned carefully, steering it away from areas that are most at risk from flooding, and ensuring that it does not exacerbate existing flooding problems.
4. *Planning Policy Statement (PPS) 25: Development and Flood Risk* has been developed to underpin decisions relating to future development (including urban regeneration) within areas that are subject to flood risk.
5. In simple terms, PPS25 requires local planning authorities to review the variation in flood risk across their district, and to steer vulnerable development (e.g. housing) towards areas of lowest risk.
6. Where this cannot be achieved and development is to be permitted in areas that may be subject to some degree of flood risk, PPS25 requires the Council to demonstrate that there are sustainable mitigation solutions available that will ensure that the risk to property and life is minimised (throughout the lifetime of the development) should flooding occur.
7. The Strategic Flood Risk Assessment (SFRA) is the first step in this process, and it provides the building blocks upon which the Council's planning and development control decisions will be made.

What is involved in a Strategic Flood Risk Assessment (SFRA)?

8. The Copeland Flood Risk Assessment (SFRA) has been carried out to meet the following key objectives:
 - **Collate all known sources of flooding** - including tidal, river, surface water (local drainage), sewers and groundwater, that may affect existing and/or future development within the Borough, and information available on where coastal erosion may increase flood risk;
 - **Identify areas that have a 'low', 'medium' and 'high' probability of flooding** -in accordance with Planning Policy Statement 25 (PPS25).
 - **Recommend appropriate land uses within flood affected areas** - in accordance with the PPS25 Sequential Test that will not unduly place people or property at risk of flooding.
 - **Recommend possible flood mitigation solutions** - that may be integrated into the design (by the developer) in areas where flood risk has been identified as a potential

constraint to future development, to minimise the risk to property and life should a flood occur (in accordance with the PPS25 *Exception Test*).

The Sequential Test

9. PPS25 advocates a sequential approach that will guide the planning decision making process (i.e. the allocation of sites). In simple terms, this requires planners to seek to allocate sites for future development within areas of lowest flood risk in the initial instance.
10. Only if it can be demonstrated that there are no suitable sites within these areas should alternative sites (i.e. within areas that may potentially be at risk of flooding) be contemplated. This is referred to as the Sequential Test.
11. As an integral part of the sequential approach, PPS25 stipulates permissible development types. This considers both the degree of flood risk posed to the site, and the likely vulnerability of the proposed development to damage (and indeed the risk to the lives of the site tenants) should a flood occur.
12. The PPS25 Sequential Test is depicted in Figure 3.1 of the Practice Guide Companion to PPS25 (Draft, February 2007) and Section 6.4.1 of this document.

The Exception Test

13. Many towns within England are situated adjacent to rivers, and are at risk of flooding. The future sustainability of these communities relies heavily upon their ability to grow and prosper. PPS25 recognises that, in some areas, including Copeland, restricting residential development from areas designated as Zone 3a High Probability may heavily compromise the viability of existing communities.
14. For this reason, PPS25 provides an Exception Test. Where a local planning authority has identified that there is a strong planning based argument for a development to proceed that does not meet the requirements of the Sequential Test, it will be necessary for the Council to demonstrate that the Exception Test can be satisfied.
15. 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 SFRA where one has been prepared. If the DPD has reached the ‘submission’ stage, the benefits of the development should contribute to the Core Strategy’s Sustainability Appraisal;*
 - *the development should be on developable, previously developed land or if it is not on previously developed land, that there are no reasonable alternative sites on previously developed land; and*
 - *a FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and where possible, will reduce flood risk overall.”*

Outcomes of the Copeland SFRA

16. The Borough of Copeland has been delineated into zones of low, medium and high probability of flooding, based upon existing available information provided by the Environment Agency. Detailed flood risk mapping has been made available for several of the principal rivers in the Borough. The Environment Agency Flood Zone Maps (April 2007) have been adopted as the basis for the SFRA for other watercourses and coastal areas where detailed modelling is not available.
17. The spatial variation in flood risk across the Borough has been delineated in the following manner:

Zone 3b (Functional Floodplain)

18. Areas subject to flooding up to (and including) once in every 20 years on average have been identified as Zone 3b Functional Floodplain. These areas are subject to relatively frequent flooding, which may include fast flowing and/or deep water. Whilst it may be impractical to refuse all future regeneration within some of these areas (especially those which are already developed), careful consideration must be given to future sustainability, planning policies have been developed accordingly.

Zone 3a High Probability

19. Areas subject to flooding up to (and including) once in every 100 years on average (i.e. Zone 3a High Probability) have been identified. Residential development should be avoided in these areas wherever possible. It is recognised however that there may be strong planning arguments as to why housing may be required in these areas.
20. To meet the requirements of the Exception Test therefore, it will be necessary for the Council to demonstrate that the development provides wider sustainability benefits to the community that outweigh flood risk. The Council must also demonstrate that the development is on developable, previously developed land or if it is not on previously developed land, that there are no reasonable alternative sites on previously developed land.
21. The SFRA has outlined specific development control conditions that should be placed upon development within Zone 3a High Probability to minimise both the damage to property, and the risk to life in case of flooding. It is essential that the developer carries out a detailed Flood Risk Assessment to consider the site-based constraints that flooding may place upon the proposed development.

Zone 2 Medium Probability

22. Areas subject to flooding in events exceeding the 100 year event, and up to (and including) once in every 1000 years on average (i.e. Zone 2 Medium Probability) have been identified. Essential community services, including emergency services, should be avoided in these areas. There are generally no other restrictions placed upon future development in these areas, however it is important to ensure that the developer takes account of possible climate change impacts to avoid a possible increase in the risk of flooding in future years (achieved through completion of a simple Flood Risk Assessment).

Zone 1 Low Probability

23. There are no restrictions placed on development within Zone 1 Low Probability (i.e. all remaining areas of the Borough). It is important to remember however that development within these areas, if not carefully managed, may exacerbate existing flooding and/or drainage problems downhill. It is necessary therefore to ensure that developers carry out a Drainage Impact Assessment. This should demonstrate that the proposed drainage system design will mitigate any possible increase in runoff that may occur from the site as a result of the proposed development.

The Way Forward

24. Several areas are at risk of flooding across the Borough. The risk of flooding posed to properties arises from a number of sources including river and coastal flooding, sewer flooding and localised run-off.
25. A planning solution to flood risk management should be sought wherever possible, steering vulnerable development away from areas affected by flooding in accordance with the PPS25 Sequential Test. Specific planning recommendations have been provided for all urban centres within the Borough.

26. Where other planning considerations must guide the allocation of sites and the Sequential Test cannot be satisfied, specific recommendations have been provided to assist the Council and the developer to meet the Exception Test. These should be applied as development control conditions for all future development. It is essential that these are applied, not only where there is a direct risk of flooding to the proposed development site, but elsewhere within the Borough. It is important to recognise that all development may potentially have an adverse impact upon the existing flooding regime if not carefully mitigated.
27. It is essential that Copeland Borough Council policy ensures that the recommended development control conditions are imposed consistently at the planning application stage. This is needed to achieve future sustainability within the Borough with respect to flood risk management. It is recommended that future revision to policy is developed in light of the suggested development control conditions presented by the SFRA (refer Section 6.5).
28. Emergency planning is imperative to minimise the risk to life posed by flooding within the Borough. It is recommended that the Council review their adopted flood risk response plan in light of the findings and recommendations of the SFRA.

A Living Document

29. The Copeland SFRA has been developed in accordance with PPS25. The SFRA has been developed building heavily upon existing knowledge with respect to flood risk within the Borough. The Environment Agency regularly review and update their Flood Zone Maps (on a quarterly basis) and a rolling programme of detailed flood risk mapping within the North West region is underway. This will improve the current knowledge of flood risk within the Borough, and may marginally alter predicted flood extents. This may therefore influence future development control decisions within these areas.
30. In summary, it is imperative that the SFRA is adopted as a 'living' document and is reviewed regularly in light of emerging policy directives and an improving understanding of flood risk within the Borough. It is recommended that the SFRA is reviewed on an annual basis during the first quarter of each year (January to March).

Table of Contents

1	Introduction.....	7
1.1	Overview	7
1.2	Future Development in Copeland.....	7
2	SFRA Approach	8
3	Policy Framework	10
3.1	Introduction.....	10
3.2	National Policy.....	10
3.3	Regional Planning Policy.....	11
3.4	Local Planning Policy	13
4	Data Collection.....	15
4.1	Overview	15
4.2	Environment Agency Flood Zone Maps.....	15
4.3	Historical Flooding.....	16
4.4	Detailed Hydraulic Modelling	16
4.5	Flood Defences.....	16
4.6	Consultation.....	17
4.7	Topography	18
5	Flood Risk in Copeland	19
5.1	Overview	19
5.2	Fluvial Flooding - Delineation of the PPS25 Flood Zones.....	20
5.3	Assessment of Risk to Life (Flood Hazard).....	21
5.4	Local Drainage Issues.....	23
5.5	Groundwater Issues	24
5.6	Climate Change	24
5.7	Residual Risk of Flooding.....	25
6	Sustainable Management of Flood Risk	27
6.1	Overview	27
6.2	Responsibility for Flood Risk Management.....	27
6.3	Strategic Flood Risk Management - The Environment Agency.....	28
6.4	Planning & Development Control – Copeland.....	30
6.5	Overview of Flood Risk & Development - Character Areas	34
6.6	Detailed Flood Risk Assessment (FRA) – The Developer	42
6.7	Local Community Actions to Reduce Flood Damage	45
6.8	Emergency Planning	45
6.9	Insurance.....	47
7	Conclusion & Recommendations.....	48

1 Introduction

1.1 Overview

31. A large proportion of the urban areas within Copeland are situated in close proximity to the coast and the Borough's watercourses. Flooding represents a risk to both property and life. It is essential therefore that planning decisions are informed, and take due consideration of the risk posed to (and by) future development by all sources of flooding, including that which arises from coastal erosion (as identified from the Shoreline Management Plans).
32. Planning Policy Statement (PPS) 25: Development and Flood Risk requires that local planning authorities prepare a SFRA in consultation with the Environment Agency. The primary purpose of the SFRA is to determine the variations in flood risk across the Borough. Robust information on flood risk is essential to inform and support the Council's revised flooding policies in its emerging Local Development Framework (LDF). Jacobs was commissioned by the Copeland Borough Council in July 2006 to develop a Strategic Flood Risk Assessment (SFRA).
33. Copeland Borough Council is the Local Planning Authority for the area of Copeland outside of the Lake District National Park. The Copeland Borough SFRA forms part of the Council's evidence base for its emerging Local Development Framework (LDF). It is a technical document that will be submitted to the Secretary of State with the submission Local Development Framework (LDF). This SFRA will be developed and refined over time and will feed into the Council's preferred site allocations for housing and employment within the Borough and will be viewed alongside supporting documents such as the Shoreline Management Plan (SMP).

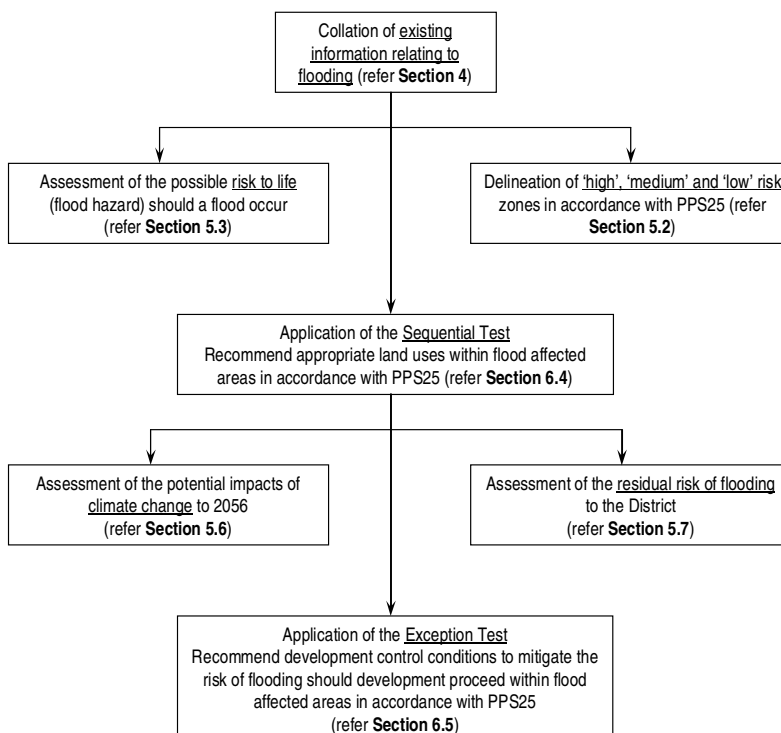
1.2 Future Development in Copeland

34. The Copeland Local Plan 2001-2016 was adopted in June 2006. The policies within the Copland Local Plan will remain until they are superseded by policies within the Development Plan Documents which make up the Local Development Framework.
35. The challenge for the Council is to secure a sustainable level and pattern of development that creates balanced communities and meets the needs of the community, including the provision of new jobs.¹ This will mean supporting existing development sites, providing appropriate levels of housing for all needs, and seeking strategic opportunities for employment growth.
36. It is anticipated that this will involve provision for moderate levels of development within the larger settlements of the Borough, known as **Key Service Centres**. Four Key Service Centres have been identified in the Copeland Borough. They are:
 - Whitehaven
 - Millom
 - Cleator Moor
 - Egremont
37. Lesser scale development will be focussed upon **Local Service Centres** which are smaller, more rural villages of the Borough. The settlements identified are:
 - Arlecdon and Rowrah
 - Beckermest
 - Bigrigg
 - Cleator
 - Distington and Common End
 - Ennerdale Bridge – Vicarage Lane
 - Frizington, Ling Beck and Rheda Close
 - Haverigg
 - Kirkland
 - Lowca
 - Moor Row
 - Moresby Parks
 - Parton
 - Seascale
 - St. Bees

¹ The North West Plan, Submitted Draft Regional Spatial Strategy for the North West of England, January 2006

2 SFRA Approach

38. The primary objective of the Copeland Borough Council SFRA is to inform the revision of flooding policies, including the allocation of land for future development, within the emerging Local Development Framework (LDF). The SFRA has a broader purpose however, and in providing a robust depiction of flood risk across the Borough, it can:
- Assist the development control process by providing a more informed response to development proposals affected by flooding, influencing the design of future development within the Borough;
 - Help to identify and implement strategic solutions to flood risk, providing the basis for possible future flood attenuation works;
 - Support and inform the Council's emergency planning response to flooding.
39. The Government provides no specific methodology for the SFRA process. Therefore, to meet these broader objectives, the SFRA has been developed in a pragmatic manner in close consultation with both the Council and the Environment Agency.
40. Various sources of information were used to aid the SFRA process. The Copeland Borough SFRA has built heavily upon existing knowledge gathered from consultations with the Environment Agency and Council, complimented with information from existing strategic investigations (refer Section 4) including Shoreline Management Plans. The Environment Agency has carried out detailed modelling of flood risk for some of the watercourses within the Borough, generating a predicted extent of flooding under extreme weather conditions. In areas where detailed modelling has not been carried out, the Environment Agency's Flood Risk Zones have been used.
41. This information has collectively been utilised to delineate the Borough into zones of 'high', 'medium' and 'low' probability of flooding, in accordance with PPS25. These zones have then been used to provide a robust and transparent evidence base for the development of flooding related policy, and the future allocation of sites for future housing and employment uses.
42. A summary of the adopted SFRA process is provided in the figure below, outlining the specific tasks undertaken and the corresponding structure of the SFRA report.



43. It is important to recognise that a small number of the watercourses that affect the Borough flow into, or from, adjoining authorities within the region. Future development within the Borough, if not carefully managed, can influence the risk of flooding posed to residents within neighbouring areas. Conversely, careless planning decisions within adjacent districts can also impact adversely upon flooding within the Borough.
44. Authorities within Cumbria are carrying out or have carried out similar strategic flood risk investigations. Whilst the delivery teams and programmes underpinning these studies vary from one district to the next, all are being developed in close liaison with the Environment Agency. Consistency in adopted approach and decision making with respect to the effective management of flood risk throughout the region is important. Regular discussions with the Environment Agency have been carried out throughout the SFRA process to this end, seeking clarity and consistency where needed.

3 Policy Framework

3.1 Introduction

45. This section provides a brief overview of the strategy and policy context relevant to flood risk in the Borough of Copeland.
46. The success of the SFRA is heavily dependent upon the Council's ability to implement the recommendations put forward for future sustainable flood risk management, both with respect to planning decisions and development control conditions (refer Section 6.5). A framework of national and regional policy directive is in place, providing guidance and direction to local planning authorities. Ultimately however, it is the responsibility of the Council to establish robust policies that will ensure future sustainability with respect to flood risk.

3.2 National Policy

3.2.1 Overview

47. National planning policy is set out through a number of Planning Policy Statements (PPSs) and Planning Policy Guidance Notes (PPGs). The Government is currently reviewing all PPGs with revised advice being set out in a PPS and, where necessary, accompanying best practice guidance.
48. PPSs and PPGs cover a full range of planning issues drawing on the central issue of sustainable development. Central themes include the re-use of previously developed land and the wish to steer inappropriate (or vulnerable) development away from areas at risk of flooding. It is a requirement that the LDF is consistent with Government planning policy.

3.2.2 Planning Policy Statement (PPS) 25: Development and Flood Risk

49. Planning Policy Statement 25 (PPS25) was released in December 2006, and underpins the process with which local planning authorities are to account for flood risk as an integral part of the planning process. The over-arching principles set out by PPS25 for the management of flood risk at a planning authority level are encapsulated in Paragraph 6 of the document:

“Regional planning bodies (RPBs) and local planning authorities (LPAs) should prepare and implement planning strategies that help to deliver sustainable development by:

Appraising risk

- *identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas;*
- *preparing Regional Flood Risk Appraisals (RFRA) or Strategic Flood Risk Assessments (SFRAs) as appropriate, as freestanding assessments that contribute to the Sustainability Appraisal of their plans;*

Managing risk

- *framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change;*
- *only permitting development in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and benefits of the development outweigh the risks from flooding;*

Reducing risk

- *safeguarding land from development that is required for current and future flood management, e.g. conveyance and storage of flood water, and flood defences;*
- *reducing flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SuDS);*
- *using opportunities offered by new development to reduce the causes and impacts of flooding, e.g. surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SuDS; re-creating functional floodplain; and setting back defences;*

A partnership approach

- *working effectively with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective and decisions on planning applications can be delivered expeditiously; and*
- *ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning.”*

50. These broad objectives effectively set the scope for the specific outcomes of the SFRA process. The SFRA in turn then informs planning and development control decisions to ensure that the objectives set out above can be achieved.

51. The guidance in PPS25 also indicates that Sustainability Appraisals should be informed by the SFRA for their area. Under the Town and Country Planning (Local Development) (England) Regulations 2004, a Sustainability Appraisal (SA) is required for all Local Development Documents (LDDs). The purpose of SA is to promote sustainable development through better integration of sustainability considerations in the preparation and adoption of plans. The Regulations stipulate that SA of LDDs should meet the requirements of the SEA Directive.

52. It is important to reiterate that PPS25 is not applied in isolation as part of the planning process. The formulation of Council policy and the allocation of land for future development must also meet the requirements of other planning policy directives, including (for example) PPS3: Housing.

53. This may introduce some apparent conflict in national policy direction. For example, PPS3 requires that “new housing should be built on previously developed land before greenfield land”. PPS25 reiterates this directive within its Exception Test, however within Copeland Borough Council a proportion of the existing brownfield land is situated within flood affected areas. The PPS25 Sequential Test recommends that residential development should not be permitted in these areas.

54. Clearly a careful balance must be sought in these instances, and the SFRA aims to assist in this process through the provision of a clear and robust evidence base upon which informed decisions can be made.

3.3 Regional Planning Policy

3.3.1 Regional Planning Guidance for the North West (RPG13)

55. Regional planning policies provide the overarching framework for the preparation of the LDF. Regional Planning Guidance for the North West (RPG13) covers the period up to 2021, and sets out the housing requirement for each county within the region. It was adopted in March 2003.

56. Under new Government legislation, a Regional Spatial Strategy to be prepared for each region of England, replacing the Regional Planning Guidance. The document for the North West is known as the North West Plan.

3.3.2 The North West Plan

57. The North West Plan has been prepared by the North West Regional Assembly (NWRA) and was submitted to the Government in January 2006. It sets out the framework for the future development of the North West of England through to 2021. Following a Government and public review, the final version of the North West Plan is expected to be published in late 2007.
58. The North West Plan will set a new housing requirement for each local authority district. The submitted North West Plan proposes that 4,140 additional dwellings should be built in Copeland Borough between 2003 and 2021. Furthermore The North West Plan stipulates that at least 70% of these should be built on brownfield sites. It is a requirement that the Core Strategy is in general conformity with regional planning policy.
59. The regional planning policies that relate to flood risk are:

Policy DP1 - Regional Development Principals

As an urgent regional priority, plans and strategies should identify, assess and apply measures to ensure effective adaptation to the likely environmental, social and economic impacts of climate-related changes. And: Proposals and schemes must take into account the local implications of climate change, particularly in vulnerable areas, coastal zones and locations at risk of flooding.

Policy EM5 – Integrated Water Management

Plans and strategies shouldmanage flood risk by.....implementing the ‘Meeting the Sequential Flood Risk Test – Guidelines for the North West Region’;

3.3.3 The Cumbria and Lake District Joint Structure Plan

60. The Cumbria and Lake District Joint Structure Plan is a statutory document which provides a strategy and policies for the development and use of land within Cumbria, including the Lake District National Park but excluding the Yorkshire Dales National Park. The aim of the Structure Plan is to secure a more sustainable pattern of development, reflecting the Government’s sustainable development objectives.
61. A number of policies within the document contain statements that apply to flood risk. Including:

“Policy ST3: Principles applying to all new development

All proposals for development including alterations to existing buildings and land use change will be required to reduce the risk of flooding within the development and elsewhere by a choice of location in the following order of priority:

- a. sites with little or no flood risk, followed by*
- b. sites with low or medium flood risk, and only then*
- c. sites in areas of high flood risk.*

Design proposals should minimise or mitigate any flood risk and where practicable include sustainable drainage systems.

Policy C42: Flood risk and development

Development proposals should take into account an assessment of the risk of flooding and be in accordance with the search sequence outlined in Policy ST3. Development will not be permitted on functional floodplains within areas with a high risk of flooding, except for essential transport and utilities infrastructure that cannot be located elsewhere, including port related development. Land use changes not requiring built development may be permitted provided adequate warning and evacuation procedures are in place, and existing buildings incorporate floodproofing measures. Elsewhere development that reduces flood risk or aids the operation of functional floodplains will be supported.

Policy C43: Coastal and flood defence

Development proposals should take into account the sustainable planning and management of coastal and flood defences. Development should:

1. *have regard to:*
 - a. *Flood risk statements and assessments,*
 - b. *Indicative Flood Plain and Flood Zone Maps,*
 - c. *Coastal Habitat Management Plans*
 - d. *Shoreline Management Plans and Coastal Defence Strategies*
2. *avoid areas of flood risk, coastal erosion and unstable land, not prejudice coastal or flood defences, nor the ability of operating authorities to maintain them, or the capacity of the coast to form a natural sea defence or to adjust to changes, without endangering life or property, and*
3. *be allowed to relocate from areas of the coast that cannot be sustainably defended in the long term.*

3.4 Local Planning Policy

3.4.1 Copeland Borough Council Local Development Framework (LDF)

62. Work has commenced on the preparation of the Local Development Framework (LDF), which will eventually replace the policies of the Local Plan. The outcomes of the Copeland Borough SFRA will inform the allocation of sites for future development, and the documentations of policies relating to flooding for incorporation into the LDF. Draft policies are unavailable at present, therefore the policies of the Local Plan will be used to inform the SFRA of development trends within the Borough.

3.4.2 Copeland Borough Council Local Plan (June 2006)

63. The Copeland Local Plan makes provision up to the year 2016, in line with the policies of the Cumbria and Lake District Joint Structure Plan. Emanating from that strategy are specific objectives and related detailed policies and proposals.

POLICY ENV 16: Flooding

“Development will not be permitted where:

- *there is an unacceptable risk of flooding, or;*
- *the development would increase the risk of flooding elsewhere, or;*
- *the development would cause interference with or loss of access to a watercourse.*

Where a proposed development is likely to be at risk from flooding or increase risk of flooding elsewhere, a Flood Risk Assessment (FRA) will be required to be submitted as part of the planning application.

Where a development requires the provision of additional flood defence and mitigation works, any costs, including maintenance, should be met by the developer.”

64. The Council acknowledges that flooding can occur almost anywhere, but that which causes most concern is on low lying ground either by inundation from the sea, by river flooding or a combination of both. Furthermore, they recognize that flooding is a potential result of climate change and global warming has led to an increase in the emphasis placed on flooding and its effects (Copeland Local Plan 6.5.1).
65. The Copeland Local Plan 2001 - 2016 targets the use of Sustainable Drainage Systems (SuDS). The adopted wording within the existing Local Plan does not impose the use of SuDS on every new development, *“The Council will require, where appropriate, the use of Sustainable Drainage Systems (SuDS) in new developments – see Policy DEV 6”* (Copeland Local Plan 6.5.3). Nonetheless the use of SuDS is strongly backed by the Council, and all Flood Risk Assessments are required to consider their use (Local Plan 6.5.4). More broadly in relation to drainage the Council has two policies:

SVC 3 Standards of Completion

“In new housing developments all foul drainage works and sewage treatment facilities must be completed in accordance with approved details before any dwelling is occupied. In the case of surface water, all drainage works shall be completed in accordance with approved details before additional impermeable areas are created.”

SVC 4 Land Drainage

“Proposals for new development involving sites in excess of 0.4 ha must be accompanied by details of all land drainage arrangements. These must be designed so as to ensure that there is no deleterious effect on adjoining occupiers of land or watercourse in the vicinity.”

“Developments will be expected to accommodate the effects of 1 in 100 year storm events and there will be a need for developers to identify overland flow routes which come into operation when the capacity of adopted sewers is exceeded. Developers are advised to seek the Environment Agency’s advice at an early stage in design” (Local Plan 8.2.5, pp192).

66. Although the Local Plan has relatively strong policy in place for reducing flood risk in new developments, it is noted that the policies for the conversion of dwellings (Local Plan HSG15 to 17, pp92-93) do not deal with flood risk. It is important to recognize that in allowing a building to change to a more vulnerable use, the risk to property and life may be increased in flood affected areas. If a building is changing its use to one with a different vulnerability classification (Table D2, Annex D, PPS25), the policy for this change should be as robust as that for new developments.
67. The adopted policy broadly encapsulates the key underlying principles set out in PPS25, however it is recommended that future revisions to the policy are developed with due consideration to the specific recommendations set out in Section 6.5 of this document. These recommendations have been identified and agreed in close consultation with the Environment Agency and the Council. They represent the minimum conditions that will be expected by the Environment Agency should development be permitted to proceed.

4 Data Collection

4.1 Overview

68. A considerable amount of knowledge exists with respect to flood risk within the Borough of Copeland, including (but not limited to):
- Historical river flooding information;
 - Information relating to localised flooding issues (surface water, groundwater and/or sewer related), collated in consultation with the Council and the Environment Agency;
 - Detailed flood risk mapping;
 - Environment Agency Flood Zone Maps (September 2006);
 - Shoreline Management Plans (Allerdale and Copeland);
 - South West Lakes Catchment Flood Management Plan (CFMP);
 - Topography (LiDAR).
69. This data has been sourced from the Council and the Environment Agency, forming the core dataset that has informed the SFRA process. The application of this data in the delineation of the 'high', 'medium' and 'low' zones of flood probability, and the formulation of planning and development control recommendations, is explained in Section 5 below. An overview of the core datasets, including their source and their applicability to the SFRA process, is outlined below.

4.2 Environment Agency Flood Zone Maps

70. The Environment Agency's Flood Map shows the natural floodplain, ignoring the presence of defences, and therefore areas potentially at risk of flooding from rivers or the sea. The Flood Map shows the area that is susceptible to a 1 in 100 (1% annual exceedance probability or AEP) chance of flooding from rivers in any one year. It also indicates the area that has a 1 in 1000 (0.1% AEP) chance of flooding from rivers and/or the sea in any given year. This is also known as the Extreme Flood Outline.
71. The Flood Map outlines have been produced from a combination of a national generalised computer model, more detailed local modelling (if available), and some historic flood event outlines. The availability of detailed modelling for the Copeland area is further discussed in Section 4.4. The Environment Agency's Flood Map provides a consistent picture of flood risk for England and Wales.
72. The Environment Agency's knowledge of the floodplain is continuously being improved by a variety of studies, detailed models, data from river flow and level monitoring stations, and actual flooding information. They have an ongoing programme of improvement, and updates are made on a quarterly basis. Notwithstanding this, it is worth noting that the Flood Zone Maps have only been used in the absence of any higher quality data. The areas with known flooding problems have generally been modelled, providing 'better' information. There are no areas with significant development pressures that do not have more detailed modelled flood extents available.
73. The Flood Map in the Borough of Copeland is provided in Appendix B, showing numerous locations being at risk from river flooding.

4.3 Historical Flooding

74. The Borough of Copeland has a considerable history of flooding with significant events (resulting in property flooding) occurring at several locations on a number of occasions. In 1999 a prolonged intense storm flooded 150 properties in Whitehaven and 30 properties in Egremont respectively. Distington and Cleator Moor were also badly affected during this same event. Lambhill Gill causing flooding of property at Parton 2004 and 2006. Distington Beck caused flooding of properties at Lowca in 2004.
75. The flood extents for historical river and tidal flooding events were provided by the Environment Agency and the Council. These outlines are limited in their usefulness for SFRA purposes as the magnitude of the mapped event is not known with a great deal of accuracy. They provide a good depiction of known flood risk areas within the Borough however, and have been used to review the delineation of the adopted flood risk zones.

4.4 Detailed Hydraulic Modelling

76. A number of detailed flooding investigations have been carried out by the Environment Agency for the River Ehen, the River Keekle, and a number of their tributaries. These studies generally incorporate the development of a detailed hydraulic model, providing a more robust understanding of the localised fluvial flooding regime in line with Section 105 (2) of the Water Resources Act.
77. At the time of writing, detailed modelled flood extents were made available for:
- Moresby Parks, River Keekle
 - Whitehaven, River Keekle
 - Moor Row, River Keekle
 - Cleator Moor, River Keekle and River Ehen
 - Cleator, River Keekle and River Ehen
 - Vicarage Lane, River Ehen
 - Egremont, River Ehen and Skirting Beck.
78. It should be noted that the detailed hydraulic models developed on behalf of the Environment Agency assume 'typical' conditions within the respective river systems that are being analysed. The predicted water levels may change if the operating regimes of the rivers involved are altered (e.g. engineering works which may be implemented in the future), or the condition of the river channel changes.
79. The flood extents derived from detailed hydraulic models are considered to be more refined and accurate than the existing Flood Zone Maps, and therefore have used to underpin the delineation of flood risk in this Strategic Flood Risk Assessment where available.

4.5 Flood Defences

80. Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flooding. They are generally categorised as either 'formal' or 'informal' defences. A 'formal' flood defence is a structure that is maintained by its respective owner, regardless of whether it is owned by the Environment Agency. An 'informal' flood defence is a structure that has often not been specifically built to retain floodwater, and is not maintained for this specific purpose. Boundary walls and industrial buildings situated immediately adjacent to rivers often act as informal flood defences.
81. A number of properties within Copeland are reliant to some degree upon the presence of localised raised defences and/or constructed barriers to protect against flooding. Haverigg and Millom are protected by a system of raised coastal defences. Cleator is protected by informal (i.e. non EA owned and/or maintained) defences on the River Ehen. Downstream of the confluence of Pow Beck and Snebra Beck, informal defences provide a degree of protection to properties within Whitehaven.

82. It is important to emphasise that the risk of flooding can never be fully addressed. There will always be a residual risk of flooding, due to (for example) a more extreme event, changing climatic conditions, and/or a structural failure of the constructed flood defence system. It is incumbent on both Council and developers to ensure that the level and integrity of defence provided within developing areas can be assured for the lifetime of the development. The National Fluvial and Coastal Defence Database (NFCDD), which is available from the Environment Agency contains details and location on known flood defences.

4.6 Consultation

83. Consultation has formed a key part of the data collation phase for the Copeland Borough SFRA. The following key stakeholders have been comprehensively consulted to inform the current investigation:

4.6.1 Copeland Borough Council

Planning: Consulted to identify areas under pressure from development and/or regeneration

Drainage: Consulted to identify areas potentially at risk from river flooding and/or urban drainage. Copeland Borough Council was also consulted as they are responsible for the management of certain sections of the former council estate sewers.

4.6.2 Environment Agency

84. The Environment Agency has been consulted to source specific flood risk information to inform the development of the SFRA. In addition, the Environment Agency is a statutory consultee under PPS25 and therefore must be satisfied with the findings and recommendations for sustainable flood risk management into the future. For this reason, the Environment Agency has been consulted during the development of the SFRA to discuss potential flood risk mitigation measures and planning recommendations.

4.6.3 United Utilities

85. United Utilities (UU) is responsible for the management of urban drainage (surface water) and sewerage within the Borough. The underground drainage systems in many towns and cities of England are being progressively upgraded from the Victorian sewers. However, they often remain under capacity and subject to relatively frequent 'overload' (i.e. resulting in flooding on the surface).

86. All water companies must keep a record of occupied properties which have been subject to sewer flooding. This record is known as the DG5 register. UU was consulted to discuss the risk of localised flooding associated with the existing drainage/sewer system. General information was provided from the DG5 register, but due to UU's confidentiality policy, detailed information could not be given. Consequently, specific areas at risk of sewer flooding cannot be identified.

87. It is highlighted however that issues associated with failures of the underground drainage/sewer systems are typically very localised, resulting in nuisance flooding to one or two properties. Issues of this nature should not preclude development. It is important to ensure that future development does not exacerbate known existing problems. Planning decisions should be made with due consideration to potential sewer capacity problems (to be advised by UU as part of the statutory LDF consultation process), and conditions should be placed upon future development to ensure that these capacity issues are rectified before development is permitted to proceed.

4.7 Topography

89. In some areas, detailed flood risk mapping has been carried out, providing a robust means of delineating zones of 'high', 'medium' and 'low' probability of flooding. In areas that have not been modelled to date, and/or in which the detailed modelling results could not be made available, dependence must be placed upon the Environment Agency Flood Zone Map, which in these areas provides a relatively coarse depiction of flood risk, as explained in Section 4.2 above.

90. Given that this is the case, a 'sensitivity' check has been carried out within areas in which detailed modelling is currently not available. The primary purpose of this check is to ensure that the adopted Environment Agency Flood Zone Map is generally representative of anticipated flooding conditions.

91. In simple terms, topography provides the basis for a common sense assessment of predicted flood zone extents. Indeed it is important to ensure that the Environment Agency Flood Zone Map reflects the fact that water flows downhill, and that water levels across the river (i.e. on either bank of the river at the same location) are equal. The Environment Agency LiDAR data has been used to reflect the topography of the Borough in this instance.

5 Flood Risk in Copeland

5.1 Overview

92. Tidal flooding is the flooding mechanism that poses the greatest threat within this coastal Borough. Much of the settlement within the Borough is located below 8mAOD, and is therefore susceptible to tidal surges. Environment Agency data suggests that around 74% of the flood risk in the South West Lakes Catchments is due to tidal flooding. The Shoreline Management Plan (SMP) will show the expected recession lines where the coast will erode to.
93. Fluvial flooding, as a result of inadequate river and stream channel capacity (i.e. typical flooding from the open watercourse) accounts for 12% of the total flood risk. Culvert related problems (11%) and sewer failure (4%) comprise the remaining sources of flood risk.
94. The principal watercourses in Copeland are the River Keekle, River Ehen, Pow Beck, River Duddon and the River Calder. Many of the watercourses within the Borough are fed from rugged fells and dales located to the east. Within this more mountainous setting, hard rock is overlain by shallow, acid peaty soils.
95. Flooding on the smaller watercourses is often related to poor channel and culvert capacity following development within the natural river floodplain. For example, within Egremont (on the banks Skirting Beck) flooding was observed during three consecutive winters (1999-2001). Out of a total of 150 properties at risk, 25 were affected during these events³.
96. Recent improvements to the level of flood protection provided to Whitehaven have been made. The Environment Agency has recently reached an agreement with the local harbour authority to modify the operation of the gates that control water levels in the harbour. Consequently, the risk of tide-locking has been reduced, preventing backwater flooding within Pow Beck. Notwithstanding this, considerable areas of Whitehaven are still subject to significant levels of flood risk. Insufficient sewer capacity, blocked culverts and trash screens are some of the mechanisms by which Pow Beck floods areas of Whitehaven.
97. In addition to the flooding associated with the primary watercourses, minor watercourses also pose a significant risk of flooding. These smaller watercourses have a tendency to respond rapidly to rainfall events and are often culverted through developed areas. Culverts are prone to blockage and/or collapse, and may be hydraulically under capacity. Typically the flooding from a minor watercourse affects only relatively small numbers of properties in isolated locations. However, the cumulative number of properties affected across the Borough can be high.
98. Water levels in the rivers and streams in the Borough of Copeland respond rapidly following intense rainfall. As a result, flood warning times are typically short, between 1 and 2 hours, and more difficult to predict accurately. Consequently, the community may be caught by surprise, resulting in damages being sustained on a more frequent basis.
99. It is important to recognise that flooding may also affect transportation links, severing evacuation routes and preventing access to food and medicine during extended periods of flooding. The result is severe disruption to communities and business. This could present a large risk to settlements in isolated locations.
100. The precise extents of fluvial flooding within the Borough is not known in all locations, and reliance has been placed (through necessity) upon the current Environment Agency flood zone maps in some areas. Whilst somewhat coarse, the flood zone maps do provide a reasonable indication of likely flood risk areas, triggering a more detailed assessment should future development be under consideration.

³ South West Lakes CFMP

101. In addition to tidal flooding, the area is susceptible from fluvial flooding from watercourses, and localised flooding from blocked and/or under capacity culverts, groundwater, rapid surface water runoff and sewer related problems.
102. It is vitally important that planning decisions recognise the potential risk that these additional sources of flooding may pose to property, and that development is planned accordingly so that future sustainability can be assured. In addition to property damage however, flooding can affect lives and livelihoods. It is absolutely essential that future development (particularly residential development) is not placed within areas of the Borough within which the safety of residents cannot be assured in times of flood.

5.2 Fluvial Flooding - Delineation of the PPS25 Flood Zones

103. It is emphasised that the **risk** of an event (in this instance a flood) is a function of both the **probability** that the flood will occur, and the **consequence** to the community as a direct result of the flood. PPS25 endeavours to assess the likelihood (or probability) of flooding, categorising the Borough into zones of low, medium and high probability. It then provides recommendations to assist the Council to manage the consequence of flooding in a sustainable manner, for example through the restriction of vulnerable development in areas of highest flood risk.
104. To this end, a key outcome of the SFRA process is the establishment of the Sequential Test in accordance with Appendix D (Table D1) of PPS25. To inform the planning process, it is necessary to review flood risk across the area, categorising the area in terms of the likelihood (or probability) that flooding will occur.
105. The Borough has been delineated into the flood zones summarised below.

Zone 3b The Functional Floodplain

Areas of the region susceptible to flooding within which “*water has to flow or be stored in times of flood*” (PPS25).

Zone 3a High Probability

Land assessed as having a 1 in 100 or greater annual probability of flooding in any year (i.e. 1% AEP).

Zone 2 Medium Probability

Land assessed as having between a 1 in 100 (i.e. 1% AEP) and 1 in 1000 (i.e. 0.1% AEP) annual probability of river flooding in any year.

Zone 1 Low Probability

Land assessed as having a less than 1 in 1000 annual probability of river flooding in any year (i.e. 0.1% AEP).

106. The delineation of the PPS25 flood zones is discussed in Section 5, and presented in the adjoining Flood Risk Maps.

5.2.1 Delineation of Zone 3b Functional Floodplain

107. Zone 3b Functional Floodplain is defined as those areas in which “*water has to flow or be stored in times of flood*”. The definition of functional floodplain remains somewhat open to subjective interpretation. PPS25 states that “*SFRAs should identify this Flood Zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes.*” For the purposes of the Copeland Borough Council SFRA, Zone 3b has been defined in the following manner:

- land where the flow of flood water is not prevented by flood defences or by permanent buildings or other solid barriers from inundation during times of flood;
- land which provides a function of flood conveyance (i.e. free flow) or flood storage, either through natural processes, or by design (e.g. washlands and flood storage areas);
- land subject to flooding in the 5% AEP (20 year) flood event (i.e. relatively frequent inundation expected, on average once every 20 years).

108. Within the Borough of Copeland, this encompasses primarily those low lying areas neighbouring the primary watercourses. Any development within these areas is likely to measurably impact upon the existing flooding regime, increasing the severity and frequency of flooding elsewhere.

5.2.2 Delineation of Zone 3a High Probability

109. Zone 3a High Probability is defined as those areas of the Borough that are situated below (or within) the 1% AEP (100 year) fluvial flood extent and/or those within the 0.5% AEP (200 year) tidal flood extent. It is emphasised that the delineation of Zone 3a High Probability does NOT consider the presence of raised defences. This is because defences do not remove the risk of flooding completely. There remains a risk that the constructed defences may fail, resulting in the rapid inundation of areas behind the defences (refer Section 5.3 below).

110. For planning purposes, the Environment Agency has issued a series of Flood Zone Maps as depicted on the Environment Agency's website (www.environment-agency.gov.uk). In those areas for which detailed flood mapping is not available and/or fit for purpose, the Environment Agency's Flood Zone Maps have been adopted to underpin the SFRA process.

111. At these locations, detailed topography has been used to carry out a 'sensitivity check' of the flood zone maps. This check has sought to ensure that the predicted floodplain extents are sensible in light of surrounding ground levels.

112. The detailed modelling outputs developed by the Environment Agency, where available, have been adopted for the delineation of Zone 3a High Probability, superseding the current EA flood zone map (September 2006). It is highlighted however that subsequent revisions of the EA web based mapping will incorporate this more detailed information in due course, updating the flood zone map so that it is consistent with the detailed modelled outlines provided.

5.2.3 Delineation of Zone 2 Medium Probability

113. Zone 2 Medium Probability is defined as those areas of the Borough that are situated between the 0.1% AEP (1 in 1000 year) and the 1% AEP (1 in 100 year) flood extents. In this instance, Zone 2 Medium Probability is defined in accordance with the Environment Agency Flood Zone Map.

114. It is noted that, given the relatively rapid rise in topography at the periphery of the floodplain, the increase in the predicted flood extents between High Risk Zone 3 and Zone 2 Medium Probability is marginal. Consequently, throughout much of the area, the difference in the FZM3 and FZM2 flood extents is limited.

5.2.4 Delineation of Zone 1 Low Probability

115. Zone 1 Low Probability is defined as those areas of the Borough that are situated above (or outside of) the 0.1% AEP (1000 year) flood extent. For SFRA purposes, this incorporates all land that is outside of the shaded Zone 2 and Zone 3 flood risk areas (as defined above).

5.3 Assessment of Risk to Life (Flood Hazard)

5.3.1 Definition of Flood Hazard

116. The assessment of flood risk has thus far considered the maximum extent to which flooding will occur during a particular flood event. This provides the basis for assessing broadly the areas potentially impacted by flooding. Of equal importance is the speed with which flooding occurs as river levels rise. The inundation of floodwaters into low lying areas can pose a considerable risk to life.
117. Substantial research has been carried out internationally into the risk posed to pedestrians during flash flooding. This research has concluded that the likelihood of a person being knocked over by floodwaters is related directly to the depth of flow, and the speed with which the water is flowing. This is referred to as 'Flood Hazard'.
118. For example, if a flood flow is relatively deep but is low energy (i.e. slow moving), then an average adult will be able to remain standing. Similarly, if the flow of water is moving rapidly but is very shallow, then once again an average adult should not be put off balance. If however the flow is both relatively deep and fast flowing, then a person will be washed off their feet, placing them at considerable risk. The risk to health and safety as a result of submerged hazards during flooding conditions (given the often murky nature of floodwaters) is also a consideration.
119. In summary, research has determined that if the product of flow depth (m) x flow velocity (m/s) is greater than or equal to $0.4\text{m}^2/\text{s}$, then an average adult is likely to be knocked off their feet. If the product of depth x velocity is greater than or equal to $0.6\text{m}^2/\text{s}$, then the average car will be washed away. These ratios have been determined through rigorous physical testing, and are widely accepted as reasonable threshold values above which it is deemed that there is a very real risk to life.
120. It is highlighted however that these figures do relate to an average healthy adult. Young children and the elderly will clearly be more vulnerable, and may be at risk in shallower and/or lower energy flow. It is also essential to emphasise that this in no way is intended to suggest that a depth x velocity ratio that is less than $0.4\text{m}^2/\text{s}$ should be adopted as the sole measure of public safety during flooding conditions. Submerged hazards including, for example, exposed manholes and tripping obstacles pose an obvious risk. Flood water is typically both poor quality and low temperature, and these too pose obvious risks to public health.
121. Defra and the Environment Agency have recently collaborated to develop a document entitled 'Flood Risk to People'. This provides guidance to aid in the review of flood hazard within the UK. Future detailed site based Flood Risk Assessments should make reference to this document when assessing the potential risk to life posed by flooding (and flood defence failure) as outlined below.

5.3.2 Flood Hazard in Copeland Borough

122. The speed and depth with which watercourses flood in Copeland is an important consideration. Deep, fast flowing water may potentially pose risk to life. This must be considered when planning future development.
123. Detailed two dimensional modelling to allow quantitative assessment of flood hazard is not available for the watercourses in Copeland. However Snebra Beck at Ribton Moor has been identified as an area where there is the potential for risk to life. A qualitative review indicates that in the areas highlighted as Zone 3b Functional Floodplain, fast flowing, deep water would be expected during a flood event. Furthermore, the functional floodplain at Egremont and Ennerdale Bridge coincides with established areas of development. It is reasonable to assume that, once again, deep fast flowing water could pose a potential hazard to life. It is anticipated that the River Bleng, on the eastern periphery of Copeland Borough Council's jurisdiction (at Gosforth) has the topographic and hydrological potential to pose a risk to life. Black Beck at The Green in Millom is also considered a watercourse that could pose a risk to life.

5.3.3 Flood Hazard due to Flood Defence Failure

124. The only formal raised defences within the Borough of Copeland are at Haverigg and Millom, providing protection against tidal flooding. Flood defences are typically raised structures that alter natural flow patterns and prevent floodwater from entering property in times of flooding.
125. There is always a residual risk that these defences may fail, as a result of either overtopping and/or breach failure. The latter could result in rapid inundation into overbank areas behind the defence, posing a potential risk to residents, pedestrians and property that may be in the path of the floodwaters.
126. A qualitative assessment of the potential risk to life within defended areas was undertaken. The raised defences at Millom typically exceed 1m in height. Given that this is the case, should (in a worst case scenario) a catastrophic structural failure of the raised defences occur during high tide levels, then a wave of flood water will rapidly inundate the area immediately behind the location of the breach. This may pose a risk to life to those who happen to be standing immediately behind the defence at the time of failure. Following the initial 'burst' of water through the defences the flood water has the potential to remain for a long duration and this also poses a risk to life.
127. At Millom, the existing flood defences are situated adjacent to existing urban development. As a result, the likelihood of a pedestrian standing immediately behind the raised flood defence during flooding conditions within the river is considered high. For this reason, the issue of potential flood hazard due to flood defence failure should affect future planning considerations informed by this SFRA.
128. The structural integrity of the existing flood defences is absolutely integral to the sustainability of both existing and future development in both Haverigg and Millom. Without the raised defences, the severity and frequency of flooding in these areas will increase. It is essential that the detailed site based Flood Risk Assessment for all potential future development in defended areas of the Borough considers both the likelihood and consequence of defence failure in the vicinity of the site.

5.4 Local Drainage Issues

129. As discussed in Section 4.6, consultation has been carried out with the Environment Agency and the Council to identify known and/or perceived problem areas. These drainage problems may be attributed to inundation from floodwaters from open drains and watercourses, and increased overland flow due to development and/or exceptionally wet weather. In some instances these problems may be due to poor maintenance, associated with (for example) culvert blockages. These issues are typically both minor and localised in nature.
130. A number of known localised problems have been identified throughout the Borough, highlighted as an outcome of flooding experienced by local residents or businesses. It is important to note that many have either subsequently been (or are in the process of being) addressed through maintenance to rectify the problem (e.g. removal of localised blockages), or they fall within the 'high' probability flood zone identified in the adjoining maps. As a result, the management of localised flooding will be an integral requirement of the detailed Flood Risk Assessment (to be completed by the developer).
131. Within the urban centres of the Borough, it is inevitable that localised flooding problems arising from under capacity drainage and/or sewer systems will occur. Input has been sought from United Utilities to pinpoint known and/or perceived problem areas, however the information provided is very general. Issues of this nature however, in addition to those outlined above, are generally localised problems that can be addressed as part of the development design process. They should therefore not influence the allocation of land for future development.
132. It is essential to ensure that future development does not exacerbate existing flooding problems. Strict planning conditions should be placed upon developers to ensure that best

practice measures are implemented to mitigate any potential increase in loading upon existing drainage system(s).

133. The Environment Agency strongly advocates the use of Sustainable Drainage Systems (SuDS). A wide variety of SuDS techniques are available (refer Section 6.6.3), potentially providing both water quality and water quantity improvement benefits on a site by site basis throughout the Borough. Wherever possible within brownfield areas, the developer should seek to reduce the rate of runoff from the site to greenfield runoff rates (i.e. the rate of runoff generated from the site assuming an open grassed area). Collectively, the effective application of SuDS as part of all future development will assist in reducing the risk of flooding to the Borough.

5.5 Groundwater Issues

134. A limited potential for groundwater flooding exists within the Borough. In the whole of the South West Lakes Catchments, less than 10 properties are thought to be at risk.
135. In Copeland, a sandstone aquifer forms a wide strip along the south-west facing coastline. Groundwater levels generally do not vary, and typically run parallel to ground levels. Much of this aquifer is overlain with clay, and therefore groundwater flooding is considered unlikely along this strip of land.
136. Further north, limestone, Millstone Grit and coal measures give rise to a series of minor aquifers. Low lying valley bottoms with this type of geology present a risk of localized short duration groundwater flooding following heavy rainfall. A few reports of groundwater flooding have been identified within the South West Lakes CFMP. Victoria Road and Bay Vista estates in Whitehaven (underlain with Carboniferous coal measures) have been identified as large areas that experience groundwater flooding issues.
137. Groundwater flooding can and does occur throughout the Borough and cannot always be predicted. It is recognised that the risks associated with groundwater flooding are not well understood, and it is important to ensure that future development is not placed at unnecessary risk.
138. In accordance with PPS25, all future development will require an appropriate Flood Risk Assessment (FRA) at the planning application stage, commensurate with the level of flood risk posed to the site. For the majority of developments in Copeland, it is likely that a detailed investigation into groundwater issues will not be necessary.
139. A detailed investigation will be required for developments in close proximity to mineral extraction sites, particularly if dewatering is being carried out. The effect of groundwater rebound after the cessation of dewatering activities will have to be carefully considered

5.6 Climate Change

140. A considerable amount of research is being carried out worldwide in an endeavour to quantify the impacts that climate change is likely to have on flooding in future years. Climate change is perceived to represent an increasing risk to low lying areas of England, and it is anticipated that the frequency and severity of flooding will change measurably within our lifetime.
141. PPS25 (Appendix B) states that a 10% increase in the 1% AEP (100 year) river flow can be expected within the next 20 years, increasing to 20% within the next 100 years. In tidally affected areas within the north west of England, an increasing rate of change in predicted sea levels is to be assumed with time, as summarised in the table below.

Recommended Contingency Allowances for Net Sea Level Rise

North West England (applied to 1990 base sea level)

PPS25 (Appendix B) Table B2

1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
4.0mm/yr	2.5mm/yr	7.0mm/yr	13.0mm/yr

142. The detailed modelling of the River Keekle, River Ehen and associated tributaries was developed prior to current Environment Agency guidelines. As a result, the modelling has not considered the potential impact of climate change. Notwithstanding this however, experience has shown that (for planning purposes) a strong analogy can be drawn between Zone 2 Medium Probability and the 1% (100 year) plus climate change extent. This is simply a function of the topography of the Borough, and in the absence of 'better' information, this is considered an entirely appropriate way forward within the strategic context of the SFRA process.
143. It is essential that developers consider the possible change in flood risk over the lifetime of the development as a result of climate change. The likely increase in flow over the lifetime of the development should be assessed proportionally to the guidance provided by PPS25 as outlined above. For example, if the proposed lifetime of the development is approximately 50 years, then the impact of a 20% increase in the 1% AEP (100 year) fluvial flow should be considered.
144. It is emphasised that the potential impacts of climate change and sea level rise will affect not only the risk of flooding posed to property as a result of river flooding, but it will also potentially increase the frequency and intensity of localised storms over the Borough. This may exacerbate localised drainage problems and the rate of coastal erosion (for further details on areas at risk of coastal erosion refer to the relevant SMP and supporting documents). It is important therefore that both the site based detailed Flood Risk Assessment and the Drainage Impact Assessment (i.e. prepared by the developer at the planning application stage as outlined in Section 6) take due consideration of climate change and sea level rise.

5.7 Residual Risk of Flooding

145. It is essential that the risk of flooding is minimised over the lifetime of the development in all instances. It is important to recognise however that flood risk can never be fully mitigated, and there will always be a residual risk of flooding.
146. This residual risk is associated with a number of potential risk factors including (but not limited to):
- a flooding event that exceeds that for which the flood risk management measures have been designed;
 - the structural deterioration of flood defence structures (including informal structures acting as a flood defence) over time; and/or
 - general uncertainties inherent in the prediction of flooding.
147. The SFRA process has carried out a review of flood risk within the Borough in accordance with the PPS25 Sequential Test, identifying a number of areas that fall within Zone 3a High Probability. The modelling of flood flows and flood levels is not an exact science. There are limitations in the methodologies used for prediction, and the models developed are reliant upon observed flow data for calibration, much of which is often of questionable quality. For this reason, there are inherent uncertainties in the prediction of flood levels used in the assessment and management of flood risk.

148. It is difficult to quantify uncertainty. The adopted flood zones underpinning the Copeland SFRA are based upon detailed flood mapping where available. Whilst these provide a robust depiction of flood risk for specific modelled conditions, the methodology is reliant upon a series of underlying assumptions and the use of empirical estimations relating to (for example) rainfall distribution and catchment response. Where the detailed modelling was not available, it was necessary to resort to the Environment Agency's national generalised computer model; these extents have an even greater degree of uncertainty associated with them.
149. Taking a conservative approach for planning purposes, it is understood that the Environment Agency generally adopt a 300mm allowance for uncertainty within areas that have been modelled in some detail. The degree of uncertainty in areas reliant upon the Environment Agency's national generalised computer model will clearly be somewhat higher. Typically, a 600mm allowance is made in such locations. However, the requirements should be clarified by the developer through consultation with the Environment Agency at the earliest opportunity.
150. It is incumbent on developers to carry out a detailed Flood Risk Assessment as part of the design process. A review of uncertainty should be undertaken as an integral outcome of this more detailed investigation.

6 Sustainable Management of Flood Risk

6.1 Overview

151. An ability to demonstrate 'sustainability' is a primary government objective for future development within the UK. The definition of 'sustainability' encompasses a number of important issues ranging broadly from the environment (i.e. minimising the impact upon the natural environment) to energy consumption (i.e. seeking alternative sources of energy to avoid the depletion of natural resources). Of particular importance however is sustainable development within flood affected areas.
152. Recent history has shown the devastating impacts that flooding can have on lives, homes and businesses. A considerable number of people live and work within areas that are susceptible to flooding, and ideally development should be moved away from these areas over time. It is recognised however that this is often not a practicable solution. For this reason, careful consideration must be taken of the measures that can be put into place to minimise the risk to property and life posed by flooding. These should address the flood risk not only in the short term, but throughout the lifetime of the proposed development. This is a requirement of PPS25.
153. The primary purpose of the SFRA is to inform decision making as part of the planning and development control process, taking due consideration of the scale and nature of flood risk affecting the Borough. Responsibility for flood risk management resides with all tiers of government, and indeed individual landowners, as outlined below.

6.2 Responsibility for Flood Risk Management

154. There is no statutory requirement for the Government to protect property against the risk of flooding. Notwithstanding this however, the Government recognise the importance of safeguarding the wider community, and in doing so the economic and social well being of the nation. An overview of key responsibilities with respect to flood risk management is provided below.
155. The Regional Assembly should consider flood risk when reviewing strategic planning decisions including (for example) the provision of future housing and transport infrastructure.
156. The Environment Agency has a statutory responsibility for flood management and defence in England. It assists the planning and development control process through the provision of information and advice regarding flood risk and flooding related issues. The Environment Agency maintains coastal flood defences rather than those that relate to coastal erosion. Despite this, the Environment Agency is under no statutory obligation to provide coastal defences.
157. The Local Planning Authority is responsible for carrying out a Strategic Flood Risk Assessment. The SFRA should consider the risk of flooding throughout the Borough and should inform the allocation of land for future development, development control policies and sustainability appraisals. Local Planning Authorities have a responsibility to consult with the Environment Agency when making planning decisions. Copeland Borough Council has permissive powers used to maintain small watercourses and provide sandbags as a courtesy. The Local Planning Authority maintains defences that relate to coastal erosion rather than coastal flood defences. Despite this, the Local Planning Authority is under no statutory obligation to provide coastal defences.
158. Landowners & Developers⁴ have the primary responsibility for protecting their land against the risk of flooding. They are also responsible for managing the drainage of their land such that they do not adversely impact upon adjoining properties.

⁴ Referred to also as 'landowners' within PPS25

6.3 Strategic Flood Risk Management - The Environment Agency

6.3.1 Overview

159. With the progressive development of urban areas along river corridors, particularly during the industrial era, a reactive approach to flood risk management evolved. As flooding occurred, walls or embankments were built to prevent inundation to developing areas. Needless to say, construction of such walls should be carefully assessed so that it does not result in the redistribution of floodwater, inadvertently increasing the risk of flooding elsewhere.
160. The Environment Agency (EA) in more recent years has taken a strategic approach to flood risk management. The assessment and management of flood risk is carried out on a 'whole of catchment' basis. This enables the Environment Agency to review the impact that proposed defence works at a particular location may have upon flooding at other locations throughout the catchment.
161. A number of flood risk management strategies are underway within the region, encompassing many of the large river systems that influence flood risk within the Copeland Borough Council. A brief overview of these investigations is provided below.

6.3.2 Catchment Flood Management Plan (CFMP)

162. *"One of the Environment Agency's main goals is to reduce flood risk from rivers and the sea to people, property and the natural environment by supporting and implementing government policies.*
163. *Flooding is a natural process – we can never stop it happening altogether. So tackling flooding is more than just defending against floods. It means understanding the complex causes of flooding and taking co-ordinated action on every front in partnership with others to reduce flood risk by:*
- *Understanding current and future flood risk;*
 - *Planning for the likely impacts of climate change;*
 - *Preventing inappropriate development in flood risk areas;*
 - *Delivering more sustainable measures to reduce flood risk;*
 - *Exploring the wider opportunities to reduce the sources of flood risk, including changes in land use and land management practices and the use of sustainable drainage systems.*
164. *Catchment Flood Management Plans (CFMPs) are a planning tool through which the Agency aims to work in partnership with other key decision-makers within a river catchment to explore and define long term sustainable policies for flood risk management. CFMPs are a learning process to support an integrated approach to land use planning and management, and also River Basin Management Plans under the Water Framework Directive.⁵*
165. River basin planning is a new strategic decision-making process introduced by the Water Framework Directive (WFD) which integrates the management of land and water within river basin districts (RBDs), which also includes flood risk management. The Directive requires the preparation of a River Basin Management Plan (RBMP) for each River Basin District in the European Union.⁶ In the England and Wales CFMP's are being used to identify the key flood risk management issues being used to inform the RBMP.
166. The South West Lakes CFMP (draft) wholly encompasses the Borough of Copeland. The CFMP takes a strategic look at flood risk within the Borough and suggests opportunities for managing the risk. The CFMP identifies specific opportunities within the Borough including:

⁵ Catchment Flood Management Plans – Volume 1 (Guidance), Version 1.0, July 2004

⁶ <http://www.sepa.org.uk/wfd/rbmp/index.htm>

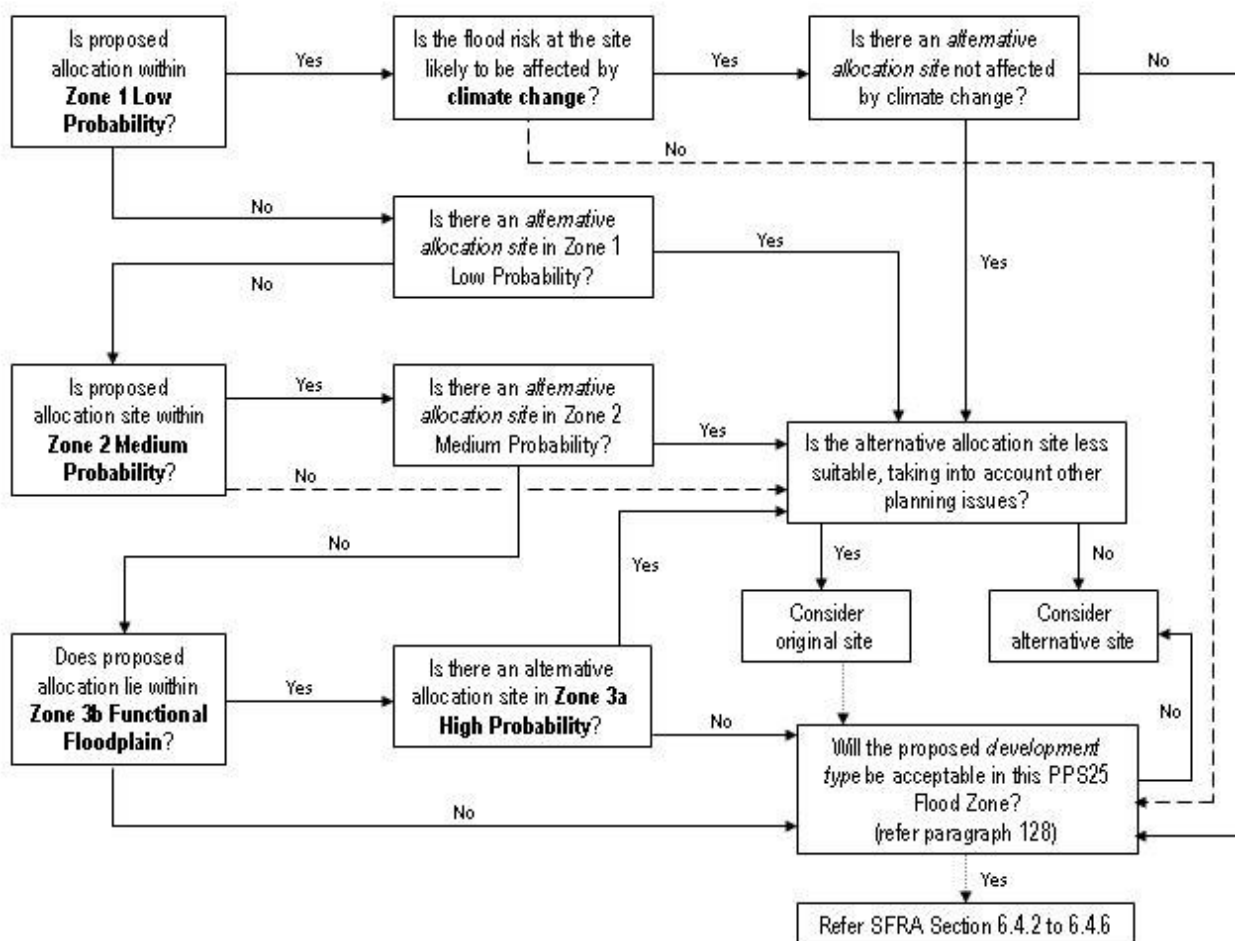
- Pow Beck: The catchment suffers from significant urban flooding, and has been acknowledged as being sensitive to changes in land-use and increased levels of urbanization. Therefore a move to rural land uses and/or improved agricultural and forestry practices could be used to mitigate flood risk. Moreover, there is potential for more efficient usage of wetlands to assist with storm water attenuation/retention within the southern reaches. This type of risk reduction is more sustainable and profits the environment by increasing habitats. In addition to aesthetic improvements, economic advantages can result from the reduced level of maintenance associated with such defence measures.
 - Egremont: Flood risk within Egremont is sensitive to changes in land use within the catchments upstream. A shift towards rural land uses and/or improved agricultural and forestry practices could be used to mitigate flood risk. A possibility exists to introduce flood storage areas in the lower reaches of the River Ehen. It may be necessary to increase the risk of flooding in restricted areas to reduce flood risk at a local scale.
 - Haverigg and Millom: Localised defences providing protection against tidal inundation are necessary. These must be maintained. There is potential for the introduction of flood storage to reduce the risk of fluvial flooding.
167. The CFMP has concluded that an increase in flood risk (and consequently damage to property) is expected within the Borough. This is due in part to an increase in the frequency and severity of flooding, due to climate change and increased urbanisation (i.e. introducing additional impermeable areas resulting in an increase in surface water runoff). It is also a result of an increase in the consequence of flooding, due to an increase in the number of properties affected by flood risk.

6.4 Planning & Development Control – Copeland

6.4.1 Planning Solutions to Flood Risk Management

The Sequential Test

168. Historically urbanisation has evolved along river corridors, the rivers providing a critical source of water, food and energy. This leaves many areas of England with a legacy of key urban centres that, due largely to their close proximity to rivers, are at risk of flooding.
169. The ideal solution to effective and sustainable flood risk management is a planning led one, i.e. steer urban development away from areas that are susceptible to flooding. PPS25 advocates a sequential approach that will guide the planning decision making process (i.e. the allocation of sites). In simple terms, this requires planners to seek to allocate sites for future development within areas of lowest flood risk in the initial instance. Only if it can be demonstrated that there are no suitable sites within these areas should alternative sites (i.e. within areas that may potentially be at risk of flooding) be contemplated.
170. This sequential approach is referred to as **The Sequential Test**. This is summarised in the following flow chart ⁸.



It is absolutely imperative to highlight that the SFRA does not attempt, and indeed cannot, fully address the requirements of the PPS25 Sequential Test. As highlighted in Section 6.4.1 and the flow chart above, it is necessary for the Council to demonstrate that sites for future development have been sought within the lowest flood risk zone (i.e. Zone 1 Low Probability). Only if it can be shown that suitable sites are not available within this zone can alternative sites be considered within the areas that are at greater risk of possible flooding (i.e. Zone 2, and finally Zone 3).

171. As indicated by the bottom right hand corner of the flow chart above, PPS25 stipulates permissible development types. This considers both the degree of flood risk posed to the site, and the likely vulnerability of the proposed development to damage (and indeed the risk to the lives of the site tenants) should a flood occur.
172. Wherever possible, the Council should restrict development to the permissible land uses summarised in PPS25 Appendix D (Table D2), (Note tables D1, D2 and D3 have been included in Appendix C of this document). This may involve seeking opportunities to 'swap' more vulnerable allocations at risk of flooding with areas of lesser vulnerability that are situated on higher ground. This is discussed further in Sections 6.4.2 to 6.4.5.

The Exception Test

173. It is recognised that only a relatively small proportion of the Borough is situated within Zone 3a High Probability. Prohibiting future residential development in these areas is unlikely to have a detrimental impact upon the economic and social welfare of the existing community, however there may be pressing planning 'needs' that may warrant further consideration of these areas. Should this be the case, the Council and potential future developers are required to work through the **Exception Test** (PPS25 Appendix D) where applicable. 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 SFRA where one has been prepared. If the Development Plan Document (DPD) has reached the 'submission' stage, the benefits of the development should contribute to the Core Strategy's Sustainability Appraisal⁹;*
 - *the development should be on developable, previously developed land or if it is not on previously developed land, that there are no reasonable alternative sites on previously developed land; and*
 - *a FRA must demonstrate that the development will be safe, without increasing flood risk elsewhere, and where possible, will reduce flood risk overall."*
174. The first two points set out in the Exception Test are planning considerations that must be adequately addressed. A planning solution to removing flood risk must be sought at each specific location in the initial instance, seeking to relocate the proposed allocation to an area of lower flood risk (i.e. Zone 1 Low Probability or Zone 2 Medium Probability) wherever feasible.
175. The SFRA has been developed in liaison with the Council and the Environment Agency to work through the requirements of the Sequential Test (and, where necessary, the Exception Test) within the Borough. It will be the responsibility of the developer (in all instances within Zone 3a High Probability and Zone 2 Medium Probability) to develop a detailed Flood Risk Assessment that can demonstrate that the Sequential Test has been applied, and (where appropriate) that the risk of flooding has been adequately addressed in accordance with PPS25.
176. The management of flood risk throughout the Borough must be assured should development be permitted to proceed, and the SFRA has provided specific recommendations that ultimately should be adopted as planning conditions for all future development. It is the

⁹ Note that the Sustainability Appraisal is carried under the Town and Country Planning (Local Development) (England) Regulations 2004, and is required for all Local Development Frameworks (LDFs).

responsibility of the prospective developer to build upon these recommendations as part of a detailed Flood Risk Assessment to ensure that the specific requirements of PPS25 can be met.

177. Specific planning and development control recommendations for future development within the Borough are presented below. A 'user guide' to assist in the application of the SFRA recommendations is provided in Appendix A.
178. An overview of flood risk throughout the Borough has been provided in Section 6.5 and the adjoining flood risk maps. **Future planning decisions should consider the spatial variation in flood risk across the Borough, as defined by the delineated flood zone that applies at the specified site location, and apply the recommendations provided below accordingly.** It is highlighted that PPS25 applies equally to both allocated sites identified within the emerging LDF and future windfall sites.

6.4.2 Future Development within Zone 3b Functional Floodplain

Planning Recommendations – Allocation of Land for Future Development

179. Future development should be restricted to water-compatible uses and essential infrastructure that has to be there (in accordance with PPS25). A number of residential and commercial areas are affected by Zone 3b Functional Floodplain. It is recommended that future redevelopment (including housing extensions) within this area is strongly discouraged. Careful consideration should be given to the Council's emergency response in times of flood to ensure that public safety is not compromised.

Development Control Recommendations – Minimum Requirements

180. Future development, with the exception of water compatible uses and essential infrastructure, should not be permitted. The frequency and severity of flooding within these areas are such that no engineered mitigation measures could be implemented to safely and effectively minimise the risk to life and property over the lifetime of the development.

6.4.3 Future Development within Zone 3a High Probability

Planning Recommendations – Allocation of Land for Future Development

- i. Future development within Zone 3a High Probability should be restricted to 'less vulnerable' land uses, in accordance with PPS25 (Appendix D) Table D2. 'More vulnerable' land uses, including residential development, should be steered towards zones of lower flood risk (i.e. Zone 2 Medium Probability or Zone 1 Low Probability) within which suitable land may be available in adjoining character areas.
- ii. Where non-flood risk related planning matters dictate that 'more vulnerable' (residential) development should be considered further, it will be necessary to ensure that the requirements of the Exception Test are satisfied. In planning terms, it must be demonstrated that "the development provides wider sustainability benefits to the community that outweigh flood risk", and that "the development is on developable previously developed land, or that there are no reasonable alternative sites on previously developed land".
- iii. To satisfy the remaining criteria of the Exception Test, all development within Zone 3a High Probability should be conditioned in accordance with the development control recommendations below.

Development Control Recommendations – Minimum Requirements

- i. All proposed future development within Zone 3a High Probability will require a detailed Flood Risk Assessment (FRA);
- ii. Floor levels must be situated above the 1% (100 year) predicted maximum flood level plus freeboard, incorporating an allowance for freeboard;
- iii. Wherever possible, ensure that dry access is provided (above flood level) to enable the safe evacuation of residents and/or employees in case of flooding. As a minimum, safe access must be provided at all locations, defined in accordance with the emerging Defra research as outlined in “Flood Risks to People”;
- iv. Basements are not to be utilised for habitable purposes. All basements must provide a safe evacuation route in time of flood, providing an access point that is situated above the 1% (100year) peak design flood level;
- v. Implement SuDS to ensure that runoff from the site (post redevelopment) is not increased, and where possible reduced. Any SuDS design must take due account of groundwater and geological conditions;
- vi. Ensure that the proposed development does not result in an increase in maximum flood levels within adjoining properties. This may be achieved by ensuring (for example) that the existing building footprint is not increased and/or compensatory flood storage is provided within the site (or upstream);
- vii. A minimum 8m buffer zone must be provided to ‘top of bank’ within sites immediately adjoining the river corridor. This requirement may be negotiated with the EA in heavily constrained locations

6.4.4 Future Development within Zone 2 Medium Probability

Planning Recommendations – Allocation of Land for Future Development

- i. In accordance with PPS25, land use within Zone 2 Medium Probability should be restricted to the ‘water-compatible’, ‘less vulnerable’ and ‘more vulnerable’ category (including residential development), or essential infrastructure, to satisfy the requirements of the Sequential Test
- ii. Where non-flood risk related planning matters dictate that ‘highly vulnerable’ (residential) development should be considered further, it will be necessary to ensure that the requirements of the Exception Test are satisfied. In planning terms, it must be demonstrated that “the development provides wider sustainability benefits to the community that outweigh flood risk”, and that “the development is on developable previously developed land, or that there are no reasonable alternative sites on previously developed land”.
- iii. To satisfy the remaining criteria of the Exception Test, all development within Zone 2 Medium Probability should be conditioned in accordance with the development control recommendations below.

Development Control Recommendations – Minimum Requirements

- i. All proposed future development within Zone 2 Medium Probability will require a Flood Risk Assessment (FRA) that is commensurate with the risk posed to the proposed development;
- ii. Floor levels must be situated above the 1% (100 year) predicted maximum flood level plus freeboard, incorporating an allowance for climate change;
- iii. Wherever possible, ensure that dry access is provided (above flood level) to enable the safe evacuation of residents and/or employees in case of flooding. As a minimum, safe

access must be provided at all locations, defined in accordance with the emerging Defra research as outlined in “Flood Risks to People”;

- iv. Implement SuDS to ensure that runoff from the site (post redevelopment) is not increased, and where possible reduced. Any SuDS design must take due account of groundwater and geological conditions (refer Section 6.6.3)

6.4.5 Future Development within Zone 1 Low Probability

Planning Recommendations – Allocation of Land for Future Development

181. There are no flood risk related constraints placed upon future development within Zone 1 Low Probability (in accordance with PPS25). Notwithstanding this, all development should be carried out in accordance with the development control recommendation below. Within ‘dry island’ areas that are surrounded by a degree of flood risk, effective emergency planning measures should be in place to ensure that the risk to life is minimised in case of flooding.

Development Control Recommendations – Minimum Requirements

182. It is important to ensure that new developments do not increase the flood risk or the rate of runoff above pre-development levels. A Drainage Impact Assessment will be required in compliance with PPS25 and current guidance and policy. This will involve the introduction of SuDS techniques to ensure that runoff from the site (post redevelopment) is not increased, and where possible reduced. Any SuDS design must take due account of groundwater and geological conditions.

6.5 Overview of Flood Risk & Development - Character Areas

The maps of the following areas are found Appendix B.

6.5.1 Character Area CP1 – Whitehaven (Key Service Centre)

SMP Unit: Whitehaven to Cunning Point (St Bees Head to River Sark SMP)

183. Whitehaven’s flood risk arises as a result of tidal, fluvial and localised drainage issues. Tidal flooding is the dominant flooding mechanism in the character area, affecting town centre locations including Strand Street, Market Place, Quay Street, Irish Street and Swingpump Lane, which are delineated as Zone 3a High Probability. Flood defence improvements have occurred recently as a result of the harbour authority operating the harbour gates in a manner that provides protection for a 0.5% (1 in 200 year) rainfall event coinciding with a high tide. To the north and south of the harbour are sandstone cliffs which are not prone to flooding but are susceptible erosion.
184. Whitehaven’s topography is generally steep. Intense rainfall events in this area are therefore likely to give rise to flash flooding. It is perceived that the drainage network is not designed to cope with such events.
185. The northern limb of Pow Beck bisects Whitehaven and discharges into the harbour. At the downstream end of Pow Beck (Coach Road), flood risk can be attributed to both fluvial and tidal sources and is shown on the flood zone maps to be Zone 3a High Probability. Sewer flooding has also been recorded in this area. Environment Agency investigations¹⁰ suggest that there is flooding at the Coach Road culvert with a frequency greater than once in every 25 years. Until investigations can be undertaken to improve the accuracy of flood risk mapping in this area, it should be treated as Zone 3b Functional Floodplain for planning purposes.
186. Further upstream within Mirehouse Estate, the area is designated Zone 2 Medium Probability. Flooding in Mirehouse can also be attributed to blockages in the sewer network. Pow Beck is largely defended upstream from the Rugby Ground and sports

¹⁰ North Area COWs Prioritisation Study (EA Project Manager, Ray Kemp). Note that the risk of flooding is based upon the comments of local residents.

facilities, where there is a large attenuation basin. At Uldale Road there is flood risk to the estate, and the CFMP attributes this to trash screen blockage. Further upstream, Pow Beck has been observed to break its banks, resulting in overland flow towards the low spot which is Croasdale Avenue.

187. Flooding has occurred in the past as a result of blockage of the trash screen and culvert at the A5094. Furthermore, the problems related to blockage are exacerbated with an insufficient sewer capacity. Flooding of Pow Beck at this location can result from either an intense storm event, or the coincidence of a storm event and a high tide. The CFMP advises that the result of a combined event at the A5094 is that road gullies fill with surcharging water and minor watercourses are prevented from flowing freely.
188. In addition to Pow Beck, a number of smaller watercourses flow through Whitehaven including Midgey Gill, Snebra Ghyll and several unnamed drains. Several recorded instances of flooding have been associated with these smaller watercourses, mainly related to problems with culvert capacity and culvert blockage. There are 3 specific sites that are known to experience flooding as a result of these minor watercourses:
- Midgey Gill is known to break its banks at Park Drive and cause flooding of surrounding property;
 - Snebra Beck results in flooding at both Bleng Avenue and at Ribton Moor Side.
 - Flooding occurs at Bleng Avenue as a result of the trash screen downstream of the wooded area becoming blocked with various debris, causing overland flow towards the houses;
 - At Ribton Moor Side, a series of blocked culverts, within a park upstream of this location, have caused flooding to approximately 5 properties. The blockages have caused high volumes of overland flow, resulting in significant erosion to a footpath within the park. Furthermore, there are concerns that if anyone was on the footpath during a flood event the depth and velocity of the flow could be sufficient to pose a threat to life. Some remedial works have been carried out since the last flooding event to reduce the risk of culvert blockage. However, the residual risk that remains following the work is unclear.
189. Whitehaven is located on the coast, to north of St. Bees Head. The town grew outwards from its harbour, and historically its primary industry was fishing. Development within Copeland will concentrate on Whitehaven as the principal town in the Borough. Whitehaven is the main employment centre within the Borough (other than Sellafield) and has the most services. It is understood that much of the emerging development pressure is for brownfield regeneration, a proportion of which is centred around the relatively flood prone Pow Beck.
190. With the exception of one sites, all proposed residential developments are within Zone 1 Low Probability. Coach Road (H10) is located partially within Zone 3a High Probability. A number of non residential developments are situated partially within Zone 3a High Probability.

6.5.2 Character Area CP2 – Cleator Moor (Key Service Centre)

191. Cleator Moor is bordered by the River Keekle to the west and the River Ehen to the east. The urbanised area of Cleator Moor generally falls within Zone 1 Low Probability, however further from the settlement are sizeable areas of Zone 3b Functional Floodplain. Fewer than 5 properties are situated within Zone 2 Medium Probability, associated with flooding from the two primary rivers. Flooding within Cleator Moor tends to arise from sources other than these main watercourses.
192. Nor Beck and Bowthorn Beck pass through Cleator Moor within culverts. These culverts are limited in capacity, resulting in localised flooding to areas surrounding Whitehaven Road and Birks Road. Detailed modelling reveals that there are areas surrounding these minor watercourses that are subject to relatively frequent flooding, and are therefore designated as Zone 3b Functional Floodplain..

193. Within the Key service centre of Cleator Moor, there is limited development pressure, focussed primarily on residential usage.
- Housing allocations HA08 (Birks Road), HA09 (Mill Hill - phase 1) and HA10 (Mill Hill – Phase 2) all lie on Greenfield land and total an area of less than 8ha;
 - Planning permission has been granted for Little Croft (H13), Market Street (H55) and Aldby Farm (H54), providing a total of 18 additional residential properties. These sites are all located within Zone 1 Low Probability, however there are known localised drainage issues in the near vicinity of some and therefore the risk level is heightened.
194. In addition to the residential sites, there are two sites where the intended use is employment related. Leconfield Industrial Estate is considered an employment opportunity, and an extension to this area is to be made to the north of the existing development. This extension largely situated within Zone 3b Functional Floodplain.

6.5.3 Character Area CP3 – Egremont (Key Service Centre)

195. Egremont lies on the banks of the River Ehen. Skirting Beck runs through the centre of the settlement and joins the River Ehen in the south of the town. Whangs Beck is a minor watercourse that flows into Skirting Beck. The response of Skirting Beck and Whangs Beck to a storm event is much flashier than the River Ehen.
196. Consultations with local residents has revealed that much of the flooding within Egremont results from under-capacity and/or blocked culverts, exacerbated by changing land use from farmland to residential:
- At Dryden Way, the storm drains cannot handle the storm water during a large event;
 - An open stretch of channel exists at Church View which is often littered with debris, reducing the channel capacity;
 - There is an open culvert junction adjacent to Wyndham School which is subject to blockage;
 - The SARSA Sports ground has been known to flood relatively frequently; and
 - Croadale Avenue has been known to flood to knee depth.
197. In the lower stretches of Skirting Beck, flooding occurs when the River Ehen causes the Beck to back up, and manholes have been known to blow as a result. A combined sewer overflow (CSO) has been introduced at the lower end of Skirting Beck and it is thought that foul water flooding may occur during a long duration storm event. During heavy rainfall, roads adjacent to the lower reaches of Skirting Beck act as overland flow paths and direct the water towards residents at Old Bridge. Consequently many of the dwellings at this location are fitted with removable flood-boards.
198. The majority of Egremont is situated within Zone 1 Low Probability. It is anticipated that flooding may still be an issue however as topographical data shows that there is a large urban area on steeply sloping land. The result of this topography is that localised drainage issues can occur as a result of direct surface water run-off during high intensity rainfall events. Extensive areas of Zone 3b Functional Floodplain, Zone 3a High Probability and Zone 2 Medium Probability exist along the waterway corridors of both Skirting Beck and the River Ehen.
199. It should be noted that a hydraulic assessment of the Orgill Estate has recently been completed for Copeland Borough Council. This assessment has identified the relevant parts of the sewer network (surface water and foul) that require upgrading to reduce flood risk. It is anticipated that work will soon be underway to address many of the problems.
200. A residual risk of flooding exists behind raised flood defences along reaches of Skirting Beck and the River Ehen. If these defences fail a hazard would be posed to people and property, particularly during a breach scenario, where large volumes of water have the potential to be released suddenly.

201. A summary of emerging development pressures is provided below:

- H16 (Gilfoot), HA12 (Egremont North 1), HA13 (Egremont North 2), HA14 Gillfoot Mansion are all located within Zone 1 Low Probability. Cumulatively these developments occupy a relatively large area, and as there are known capacity issues both surface water and potentially sewerage, it is essential that any Flood Risk Assessments address drainage issues;
- A portion of H17 Old Castle Cinema lies within Zone 3b Functional Floodplain;
- A portion of H56 Ghyll Farm occupies Zone 3a High Probability;
- Employment opportunity EEOS1 is partially located within Zone 2 Medium Probability; Bridge End (E9) is partially falls within Zone 3a High Probability;
- Bridge End Extension (E10) is wholly situated within Zone 1 Low Probability.

6.5.4 Character Area CP4 – Millom (Key Service Centre)

SMP Units: Haverigg to Millom and Inner Duddon Estuary – Millom to Dunnerholme Point (St Bees Head to Earnse Point SMP)

202. Millom is situated on the Duddon Estuary at an elevation of approximately 7mAOD. Parts of the town and much of the periphery are located within Zone 3a High Probability. Defences are present, however the EA has suggested that these defences are not up to standard. Most the defences consist of earth embankments. Coastal erosion is threatening the railway embankment which acts as a defence to some parts of Millom.
203. Principally flood risk arises from tidal flooding, but the area has the potential to be flooded by storm events on the River Duddon and from minor watercourses such as Haverigg Pool and Salthouse Pool.
204. At Salthouse Bridge, flooding has been known to occur as a result of failure of the floodgates. At two locations within Zone 1 Low Probability there have been reports of flooding, these are Buttermere Drive and Millom Fire Station. There have been reports of flooding on Devonshire Road which is partially located within the higher risk flood zones.
205. All proposed residential development sites are within Zone 1 Low Probability (H60, H57, H21, HA31, HA30, H58). Employment sites at Mainsgate Road and Devonshire Road (west) are situated within Zone 3a High Probability. .

6.5.5 Character Area CP5 – Distington and Common End (Local Service Centre)

206. Distington and Common End are situated adjacent to the River Lowca. A small area of Distington (The Coppers) falls within Zone 2 Medium Probability. The western border of Common End is within Zone 3a High Probability, and the remaining areas of Character Area CP5 are Zone 1 Low Probability. Defences exist at Beck Green. Localised groundwater (or historic field drainage) issues have been identified at Common End.
207. Hinnings Farm (H26) is the site with most number of approved Greenfield dwellings in Copeland. Whilst it is situated within Zone 1 Low Probability, the River Lowca flows through urbanised areas downstream, and it is important that any large scale development does not exacerbate the potential for flooding downstream.

6.5.6 Character Area CP6 – Lowca (Local Service Centre)

SMP Units: Whitehaven to Cunning Point (St Bees Head to River Sark SMP)

208. Lowca is situated between the River Lowca to the south and the Irish Sea to the west. According to the flood maps, Lowca is situated within Zone 1 Low Probability. Lowca does however have a flood risk posed by a localised drainage issue. In 2004, foul water flooding occurred to four properties within Stamford Hill. Ghyll Bank and Meadow view experience flood problems as a result of a ditch that requires maintenance.
209. Ghyll Bank (H32) has 20 approved dwellings on a Brownfield site, 9 of which have currently been developed. The site is located at the upstream end of Lowca, and therefore it is

important to ensure that development on either site does not increase flood risk within Lowca.

6.5.7 Character Area CP7 – Parton (Local Service Centre)

SMP Unit: Whitehaven to Cunning Point (St Bees Head to River Sark SMP)

210. Parton is situated on the Irish Sea coast. It is protected from tidal flooding by a railway rock armour revetment which was constructed in 1997. Chiefly the area is Zone 1 Low Probability, however there is a small portion of the settlement to the west that lies within Zone 3a High Probability.
211. It should be noted that the flood zone maps do not show the extent of the fluvial flooding in character area CP7. The true extent of annual flooding covers most of Foundry Road and the Square. This area has been identified as the worst example of flooding in Copeland, with water depths of 60cm recorded in Foundry Road in December 2006.
212. In addition to the tidal flood risk, there is a flood risk posed by Lambhill Gill. Parton's topography is generally steep. Intense rainfall events in this area are therefore likely to give rise to flash flooding. There have been events where the culvert has surcharged, and this could be attributed to a blockage on the foreshore.
213. Whites Row adopted housing allocation (HA27) is located within Zone 3a High Probability.

6.5.8 Character Area CP8 – Moresby Parks (Local Service Centre)

214. Moresby Parks is situated entirely within Zone 1 Low Probability. School Brow and Churchill Drive suffered from flooding in 2004, 2005 and throughout 2006. Flooding problems have persisted on the land adjacent to and including Railway Cottages and Churchill Drive. The origin of flooding at the former is not fully understood but at the latter is believed to be partly as a result of insufficient capacity in the surface water sewer. Also the new properties, on the bowling green, also suffer from a degree of flooding. Moresby Parks Road is known to have suffered from sewer flooding in 2004.
215. There is a residential development allocation and a commercial park. Railway Cottages (H50) has approval for 20 dwellings on Greenfield land. Whitehaven Commercial Park (E2) is 12.7 (ha) of employment land with planning permission, on primarily Greenfield land.
216. These settlements are situated on the River Keekle, upstream of other communities. Increased urbanisation could aggravate flood risk at settlements downstream, and particular care should be taken to ensure that existing problems downstream are not made worse.

6.5.9 Character Area CP9 – Arlecdon and Rowrah (Local Service Centre)

217. The settlements of Arlecdon and Rowrah are located at 200mAOD in Zone 1 Low Probability. The area is drained from a series of minor watercourses. Arlecdon Park Road experiences flooding issues as a result of insufficient capacity of a surface water culvert and the sewers.
218. Rowrah goods yard (HA19) is a 1.2ha housing allocation south of Rowrah Road. The housing allocation is anticipated to accommodate 35 dwellings on Brownfield land.

6.5.10 Character Area CP10 – Frizington, Lingla Beck and Rheda Close (Local Service Centre)

219. These areas lie between the watercourses of Winder Beck and Dub Beck. The area is wholly situated within Zone 1 Low Probability and there are no known drainage issues.
220. Within this character area permission has been granted for 4 housing sites, an employment site, and a residential allocation has been made:

- Lingla Bank (HA25) is a 1.3 ha housing allocation which connects to the settlement of Rheda Close;
- Residential planning permission has been granted for Dower House (H28), Rheda Park (H29) and Kangol (H48), a mixture of Greenfield and Brownfield sites.

6.5.11 Character Area CP11 – Kirkland (Local Service Centre)

221. Kirkland is a small settlement situated in the east of Copeland at an elevation of approximately 200mAOD. Much of the surrounding landscape has been previously mined. Drainage of the area is dominated by a series of sinks and springs with a small watercourse, Hawes Gills, draining the eastern portion of the settlement. Kirkland is wholly situated within Zone 1 Low Probability. Furthermore there are no known localised drainage issues. There are currently no development pressures within this character area.

6.5.12 Character Area CP12 – Vicarage Lane, Ennerdale Bridge (Local Service Centre)

222. Ennerdale Bridge is largely situated within the Lake District National Park administrative region. A small portion to the north of the boundary, Vicarage Lane, falls within Copeland.

223. The confluence of Croasdale Beck (draining from Loweswater Fell) and the River Ehen (fed from Ennerdale Water) is located within 200m of Vicarage Lane. Section 105 mapping of both watercourses reveals a significant area of Ennerdale Bridge as Zone 3b Functional Floodplain, however this is outwith the administrative power of Copeland Council. For the area within Copeland (Vicarage Lane), five properties fall within Zone 3a High Probability. For the larger part, Vicarage Lane is Zone 1 Low Probability, with the exception of approximately 8 properties south of the road (that are within Zone 2 Medium Probability).

224. Currently there are no development pressures within Vicarage Lane.

6.5.13 Character Area CP13 – Cleator (Local Service Centre)

225. Cleator is located on the small strip of land bordered by the River Keekle to the west and the River Ehen to the east. A significant area of Cleator (approximately 40 properties) is situated within Zone 3a High Probability. The remainder of the area is generally Zone 1 Low Probability.

226. Housing allocation (HA33) Main Street a 0.7ha Greenfield site, it is envisaged that approximately 20 dwellings could be established here. This site is actually partially located within Zone 3a High Probability. In addition to the residential sites, there is a site set aside as employment land, (Cleator Moor, E8). This site is wholly situated in Zone 3a High Probability.

227. These areas are defended by raised embankments, however the standard of protection of these defences cannot be assured and it is known that these areas have previously flooded causing damage to the factory and houses (October 2000) .

6.5.14 Character Area CP14 – Moor Row (Local Service Centre)

228. Moor Row lies on the western bank of the River Keekle, downstream of Cleator Moor. The entire settlement is wholly situated in Zone 1 Low Probability, however Zone 3b Functional Floodplain is located very close to the north-east corner of the settlement.

229. All proposed development is on the western side of the settlement, therefore the flood risk from the River Keekle is very low. Two proposed employment sites (Westlakes 2 and 3) have been proposed, neither of which has been completed.

230. It is known that flooding in St. Bees has occurred as a result of overland flow channelling along the road from Moor Row. The impact that further development of Moor Row would have on flooding in St. Bees should be contemplated when considering future development.

6.5.15 Character Area CP15 – Bigrigg (Local Service Centre)

231. Bigrigg lies on the A595 route between Egremont and Whitehaven at approximately 100mAOD. The entire area is situated within Zone 1 Low Probability and there are no known drainage issues. Development is restricted to one small site, Rear Old Captain's House (H24, Greenfield site).

6.5.16 Character Area CP16 – St Bees (Local Service Centre)

SMP Units: St Bees Head, St Bees Promenade and St Bees Promenade to Pow Beck (St Bees Head to Earnse Point SMP)

232. St Bees lies on the Irish Sea coast, just south of a headland. The area is subject to flooding from tidal, fluvial and overland flow mechanisms. St Bees topography is steep, intense rainfall events in this area are therefore likely to give rise to flash flooding. St Bees flooded twice in 2006 from Outrigg when a flashy storm event overwhelmed the drains, gullies and sewer network.
233. Pow Beck flows through the centre of the village, and Rottington Beck flows in a southerly direction to the west. In addition to both tidal and fluvial flood risk, there is a risk associated with runoff from Egremont and Moor Row channelling down roads to St Bees.
234. Tidal flood risk and coastal erosion are reduced to a degree from a revetment which is in fair condition, and a sea wall with armoured protection to the north. There is a surface water culvert that discharges into Rottington Beck at Gutterfoot and this is at risk of being blocked by beach debris following a storm and could flood a small number of properties along Beach Road.
235. Predominantly the area is Zone 1 Low Probability. The small areas of Zone 2 Medium Probability and Zone 3a High Probability are largely undeveloped. Two sites have planning permission granted for residential usage. Seacote (H39) is wholly situated in Zone 1 Low Probability. Rottington Hall (H61) is partially contained within Zone 3a High Probability.

6.5.17 Character Area CP17 – Beckermat (Local Service Centre)

236. Beckermat is situated on the confluence of Kirk Beck and Black Beck, just upstream of their confluence with the River Ehen. Flood risk mainly occurs as a result of the culverted watercourses and lack of channel capacity. A significant portion of the properties in Beckermat are within Zone 3a High Probability (associated with both Kirk Beck and Black Beck), the remainder of the settlement is Zone 1 Low Probability.
237. Crofthouse Farm (HA20) is the only housing allocation within Beckermat. This Brownfield site is 0.2ha and the anticipated residential capacity is 5 dwellings, situated within Zone 1 Low Probability.

6.5.18 Character Area CP18 – Seascale (Local Service Centre)

SMP Units: Pow Beck to Whitriggs Scar and Whitriggs Scar to Drigg Point (St Bees Head to Earnse Point SMP)

238. Seascale sits adjacent to the sandy coastline, situated within Zone 1 Low Probability. There is only one narrow strip of Zone 3a High Probability that is largely restricted to the Whitriggs Beck waterway corridor. It is perceived that Seascale is at risk of coastal erosion and flooding as a result of this puts the promenade, main road and some properties at risk.
239. Seascale is not subject to significant development pressures. There are two proposed residential sites Scafell Hotel (H37) and Seascale School (HA34), and an employment site at Seascale Rural Workshops (E21). All of the development sites are located wholly within Zone 1 Low Probability.

6.5.19 Character Area CP19 – Haverigg (Local Service Centre)

SMP Units: Selker Point to Haverigg and Haverigg to Millom (St Bees Head to Earnse Point SMP)

240. Haverigg sits at an approximate elevation of 5mAOD at the mouth of the Duddon Estuary. Flood risk is both fluvial and tidal, but mainly tidal. The fluvial flood risks are associated with Haverigg Pool and the River Duddon. Haverigg village centre is located within Zone 1 Low Probability, and a large portion of the periphery is within Zone 3a High Probability and Zone 2 Medium Probability. Approximately 65 properties are contained within Zone 2 Medium Probability.
241. Since 1993, a coastal defence scheme consisting of armoured coastal protection has defended Haverigg. The Shoreline Management Plan considers there to be no risk to life or property within Haverigg. Notwithstanding this however, the defences cannot eliminate risk entirely. If the defences failed the land is sitting at such a low-lying elevation that the area could be flooded for a considerable duration. Furthermore if a tidal event were to occur at the same time as a fluvial one, the watercourse would in effect be prevented from draining effectively (tidal locking) and this could result in higher flood levels and a longer flood duration.
242. It is noted that at present the land within Zone 3a High Probability is being used for uses considered 'More Vulnerable' (according to the Sequential Test) such as the Caravan Park and school. Poolside (H49) is shown in the adopted Local Plan as having planning permission for 80 dwellings on a Brownfield site (granted January 2004). This site is located within Zone 3a High Probability and is at risk from Haverigg Pool, the Duddon Estuary and tidal flooding.

6.5.20 Remaining Areas of the Borough

243. All remaining areas are not subject to any significant future development pressures. Fluvial flooding and localised flooding issues may exist and these will need to be investigated on an individual basis by the developer.
244. There are no flood risk related constraints placed upon future development within Zone 1 Low Probability (in accordance with PPS25). Notwithstanding this, a Drainage Impact Assessment will be required in compliance with PPS25 and current guidance and policy. This will involve the introduction of SuDS techniques. Any SuDS design must take due account of groundwater and geological conditions.

6.6 Detailed Flood Risk Assessment (FRA) – The Developer

6.6.1 Scope of the Detailed Flood Risk Assessment

245. As highlighted in Section 2, the SFRA is a strategic document that provides an overview of flood risk throughout the area. It is imperative that a site-based Flood Risk Assessment (FRA) is carried out by the developer for all proposed developments, and this should be submitted as an integral part of the planning application.
246. The FRA should be commensurate with the risk of flooding to the proposed development. For example, where the risk of flooding to the site is negligible (e.g. Zone 1 Low Probability), there is little benefit to be gained in assessing the potential risk to life and/or property as a result of flooding. Rather, emphasis should be placed on ensuring that runoff from the site does not exacerbate flooding lower in the catchment. The particular requirements for FRAs within each delineated flood zone are outlined below.

It is highlighted that the description of flood risk provided in the Character Area discussions above place emphasis upon the primary sources of flood risk (i.e. tidal and river flooding). In all areas, a localised risk of flooding may also occur, typically associated with local catchment runoff following intense rainfall passing directly over the Borough. This localised risk of flooding must also be considered as an integral part of the detailed Flood Risk Assessment.

247. Proposed Development within Zone 3a High Probability

All FRAs supporting proposed development within Zone 3a High Probability should include an assessment of the following:

- The vulnerability of the development to flooding from other sources (e.g. surface water drainage, groundwater) as well as from river and tidal flooding. This will involve discussion with the Council and the Environment Agency to confirm whether a localised risk of flooding exists at the proposed site.
 - The vulnerability of the development to flooding over the lifetime of the development (including the potential impacts of climate change), i.e. maximum water levels, flow paths and flood extents within the property and surrounding area. The Environment Agency may have carried out detailed flood risk mapping within localised areas that could be used to underpin this assessment. Where available, this will be provided at a cost to the developer. Where detailed modelling is not available, hydraulic modelling by suitably qualified engineers will be required to determine the risk of flooding to the site.
 - The potential of the development to increase flood risk elsewhere through the addition of hard surfaces, the effect of the new development on surface water runoff, and the effect of the new development on depth and speed of flooding to adjacent and surrounding property. This will require a detailed assessment, to be carried out by a suitably qualified engineer.
 - A demonstration that residual risks of flooding (after existing and proposed flood management and mitigation measures are taken into account) are acceptable. Measures may include flood defences, flood resistant and resilient design, escape/evacuation, effective flood warning and emergency planning.
 - Details of existing site levels, proposed site levels and proposed ground floor levels. All levels should be stated relevant to Ordnance Datum.
248. It is essential that developers thoroughly review the existing and future structural integrity of the defences (i.e. over the lifetime of the development), and ensure that emergency planning measures are in place to minimise risk to life in the unlikely event of a defence failure.
249. Proposed Development within Zone 2 Medium Probability

For all sites within Zone 2 Medium Probability, a high level FRA should be prepared based upon readily available existing flooding information, sourced from the EA. It will be necessary to demonstrate that the residual risk of flooding to the property is effectively managed through, for example, the provision of raised floor levels (refer Section 6.6.2) and the provision of a planned evacuation route and/or safe haven.

250. Proposed Development within Zone 2 Medium Probability and Zone 1 Low Probability

Within all areas of the Borough, the risk of alternative sources of flooding (e.g. urban drainage and/or groundwater) must be considered, and sustainable drainage techniques must be employed to ensure no worsening to existing flooding problems elsewhere within the area.

251. The SFRA provides specific recommendations with respect to the provision of sustainable flood risk mitigation opportunities that will address both the risk to life and the residual risk of flooding to development within particular 'zones' of the area. These recommendations should form the basis for the site-based FRA.

6.6.2 Raised Floor Levels & Basements (Freeboard)

252. The raising of floor levels above the 1% AEP (100 year) fluvial flood level will ensure that the damage to property is minimised. Given the anticipated increase in flood levels due to climate change, the adopted floor level should be raised above the 1% AEP (100 year) predicted flood level assuming an increase in flow and/or tide level over the next 50 years (refer Section 5).

253. Wherever possible, floor levels should be situated a minimum of 300mm above the 1% AEP (100 year) plus climate change flood level, determined as an outcome of the site based FRA. A minimum of 600mm above the 1% AEP (100 year) flood level should be adopted if no climate change data is available. The height that the floor level is raised above flood level is referred to as the 'freeboard', and is determined as a measure of the residual risks.

254. The use of basements within flood affected areas should be discouraged. Where basement uses are permitted however, it is necessary to ensure that the basement access points are situated 300mm above the 1% AEP (100 year) flood level plus climate change. The basement must be of a waterproof construction to avoid seepage during flooding conditions. Habitable uses of basements within flood affected areas should not be permitted

6.6.3 Sustainable Drainage Systems (SuDS)

255. SuDS is a term used to describe the various approaches that can be used to manage surface water drainage in a way that mimics the natural environment. The management of rainfall (surface water) is considered an essential element of reducing future flood risk to both the site and its surroundings. Indeed reducing the rate of discharge from urban sites to greenfield runoff rates is one of the most effective ways of reducing and managing flood risk within the Borough.

256. SuDS may improve the sustainable management of water for a site by¹¹:

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- reducing volumes and the frequency of water flowing directly to watercourses or sewers from developed sites;
- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- reducing potable water demand through rainwater harvesting;
- improving amenity through the provision of public open space and wildlife habitat;
- replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

¹¹ Interim Code of Practice for Sustainable Drainage Systems National SuDS Working Group, 2004

257. In catchment terms, any reduction in the amount of water that originates from any given site is likely to be small. Cumulatively, if applied across the catchment in a consistent manner, the effect of a number of sites could be significant.
258. There are numerous different ways that SuDS can be incorporated into a development and the most commonly found components of a SuDS system are described in the following table¹². The appropriate application of a SuDS scheme to a specific development is heavily dependent upon the topography and geology of the site (and its surrounds). Careful consideration of the site characteristics must be assured to ensure the future sustainability of the adopted drainage system.

SuDS Component	Description
Pervious surfaces	Surfaces that allow inflow of rainwater into the underlying construction or soil.
Green roofs	Vegetated roofs that reduce the volume and rate of runoff and remove pollution.
Filter drain	Linear drains consisting of trenches filled with a permeable material, often with a perforated pipe in the base of the trench to assist drainage, to store and conduct water; they may also permit infiltration.
Filter strips	Vegetated areas of gently sloping ground designed to drain water evenly off impermeable areas and to filter out silt and other particulates.
Swales	Shallow vegetated channels that conduct and retain water, and may also permit infiltration; the vegetation filters particulate matter.
Basins, Ponds and Wetlands	Areas that may be utilised for surface runoff storage.
Infiltration Devices	Sub-surface structures to promote the infiltration of surface water to ground. They can be trenches, basins or soakaways.
Bioretention areas	Vegetated areas designed to collect and treat water before discharge via a piped system or infiltration to the ground
Pipes and accessories	A series of conduits and their accessories normally laid underground that convey surface water to a suitable location for treatment and/or disposal. (Although sustainable, these techniques should be considered where other SuDS techniques are not practicable).

259. For more guidance on SuDS, the following documents and websites are recommended as a starting point:

- Interim Code of Practice for Sustainable Drainage Systems, National SuDS Working Group, 2004
- Planning Policy Statement 25 – Development and Flood Risk, Annex F, Communities and Local Government, Decemer 2006.
- www.ciria.org.uk/suds/

¹² Interim Code of Practice for Sustainable Drainage Systems National SuDS Working Group, 2004

6.7 Local Community Actions to Reduce Flood Damage

260. Copeland Borough is a mostly rural area, and a large proportion of the properties at risk are in isolated locations and at risk of flooding from small watercourses and surface water run-off. These types of floods are typically short in duration, of a minimal depth, and are not normally economically viable to address in a strategic manner.
261. It is essential therefore to ensure a broad awareness with respect to flood risk, providing the community with the knowledge (and tools) that will enable them to help themselves should a flood event occur.
262. The following 'community based measures' are cost effective solutions that local communities may introduce to minimise the damage sustained to their own homes in the case of flooding.

6.7.1 Flood Proofing

263. The 'flood proofing' of a property may take a variety of forms:

For **new homes** and/or **during redevelopment**

- *Raising of floor levels*
The raising of floor levels above the anticipated maximum flood level ensures that the interior of the property is not directly affected by flooding, avoiding damage to furnishings, wiring and interior walls. It is highlighted that plumbing may still be impacted as a result of mains sewer failure.
- *Raising of electrical wiring*
The raising of electrical wiring and sockets within flood affected buildings reduces the risks to health and safety, and reduces the time required after a flood to rectify the damages sustained.

For **existing homes**

- *Flood boards*
The placement of a temporary watertight seal across doors, windows and air bricks to avoid inundation of the building interior may be suitable for relatively short periods of flooding. However the porosity of brickwork may result in damage being sustained should water levels remain elevated for an extended period of time. This may lessen the effectiveness of flood proofing to existing properties affected by flooding from larger river systems such as the Ehen.

6.8 Emergency Planning

264. Emergency planning is a critical element of any sustainable flood risk management solution. Liaison with both the Environment Agency and emergency services is imperative.
265. The Environment Agency monitor river levels within the main rivers affecting the Borough and based upon weather predictions provided by The Met Office, make an assessment of the anticipated maximum water level that is likely to be reached within the proceeding hours (and/or days). Where these predicted water levels are expected to result in the inundation of populated areas¹³, the Environment Agency will issue a series of flood warnings within defined flood warning areas, encouraging residents to take action to avoid damage to property in the first instance.
266. As water levels rise and begin to pose a risk to life and/or livelihood, it is the responsibility of the Council to coordinate the evacuation of residents. This evacuation will be supported and facilitated by the emergency services. It is essential that a robust plan is in place that clearly sets out (as a minimum):
- roles and responsibilities;

¹³ Restricted to those urban areas situated within Environment Agency flood warning zones

- paths of communication;
 - evacuation routes;
 - community centres to house evacuated residents;
 - contingency plans in case of loss of power and/or communication.
267. Cumbria County Council, who is the body responsible for the Emergency Planning during major events, has a long established Multi-Agency Flooding Response Plan. This plan covers the co-ordination of an emergency i.e. receptor centres, welfare, etc. These plans are exercised regularly and have stood the test of real events.
268. Emergency planning in Copeland is complicated by the rural (and hence dispersed) nature of the population. Apart from the Key Service Centres, the Borough comprises relatively small villages and settlements spread out over a wide area.
269. During a Borough-wide flood event, the council and other Emergency Services could find it difficult to provide assistance to large portions of the population. Warning times are short, travel distances are long and rural roads may be cut off or damaged by flooding.
270. In order to manage a flood related emergency event as effectively as possible, pre-planning is essential. The Council should:
- Identify villages or village clusters most at risk (isolation, population, vulnerability)
 - Install a local emergency response capability/plan for those centres which are unlikely to be reached by council staff or emergency services.
 - Develop a post-event plan to manage the after effects of the flood.
271. At County level, the Emergency Planning section has acknowledged that in certain areas the emergency response may be limited and that it is unfeasible to provided emergency cover for all of the small villages and settlements. Consequently, they are now in the process of implementing community resilience measures that will come into effect during an emergency event, which would include flooding. One measure, for example, involves a nominated person knocking on the door of known vulnerable people in the area on a receipt of a flood warning.
272. 'Dry' access (i.e. above flood level) should be sought wherever possible as part of future planning applications to ensure that all residents can be safely evacuated in times of flood. As part of their long term strategy for road maintenance and improvement, the County Council progressively should seek opportunities to raise critical evacuation routes above the greater of the 1% AEP + 20% flow (i.e. climate change) flood level if feasible. As an absolute minimum, 'safe' access must be assured during the 1% AEP (100 year) fluvial flood level, defined with due consideration to the emerging Defra research presented in "Flood Risk to People". It is highlighted that road raising must not have a detrimental impact upon flow routes and/or the effectiveness of floodplain storage.
273. Residents in areas affected by flooding on a more frequent basis (e.g. in the 5% (20 year) event) are likely to be the most vulnerable as water levels rise. These areas will flood more frequently than other areas of the Borough, and are likely to be the first cut off from safe evacuation routes.
274. Another problem for Copeland Borough Council is that it is responsible for emergency planning in the Lake District National Park, however spatial planning within the National Park is carried out by the Lake District National Park Authority. The impact of this is that, during a flood event, the effectiveness of Copeland Borough Council to evacuate people to safe places is influenced by the decisions of another authority.
275. There is a clear need for both parties to work together so that the planning decisions made do not adversely affect the ability of Copeland Borough Council to provide an adequate emergency response.

6.9 Insurance

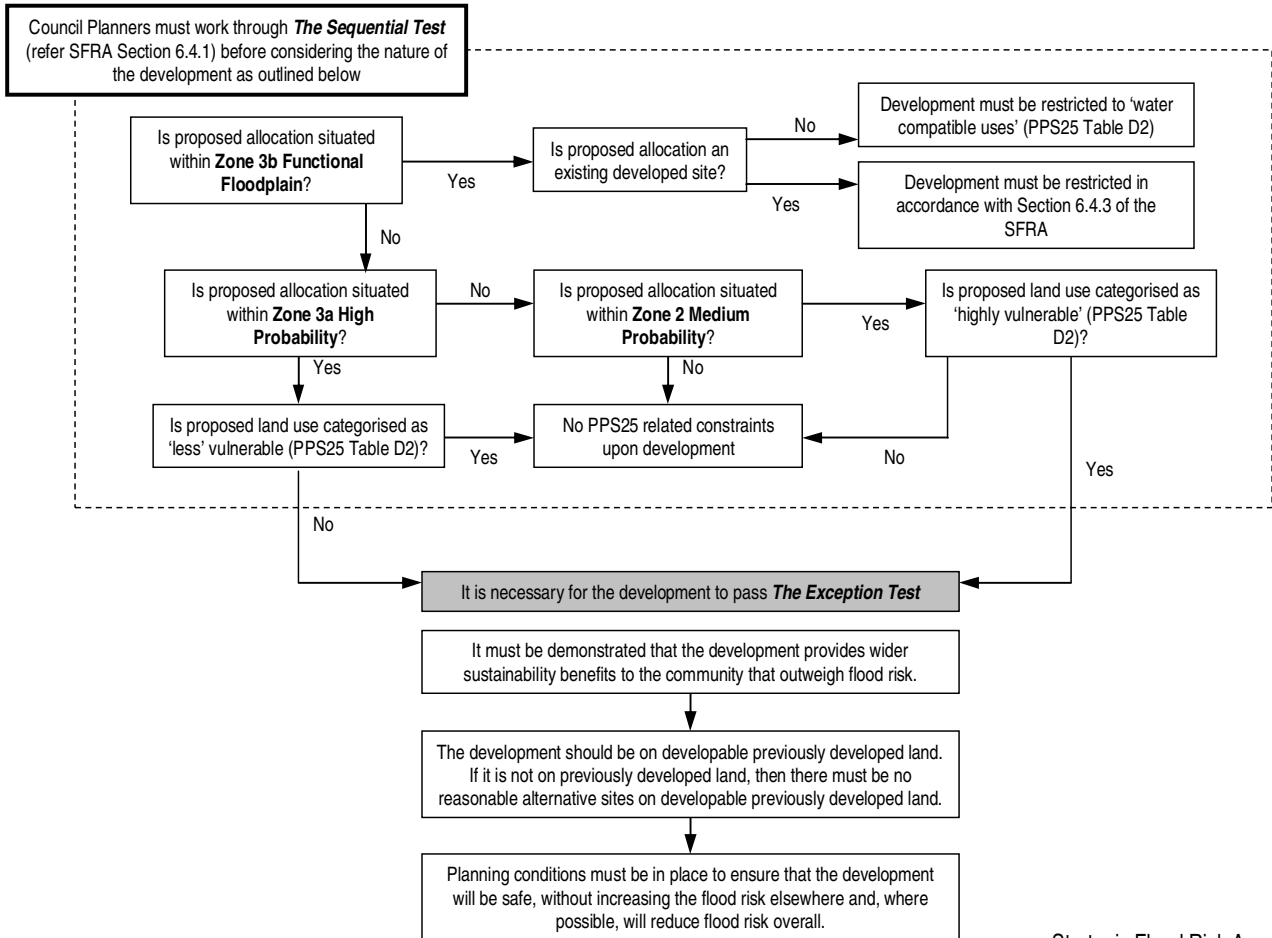
276. Many residents and business owners perceive insurance to be a final safeguard should damages be sustained as a result of a natural disaster such as flooding. Considerable media interest followed the widespread flooding of 2000 when it became clear that the insurance industry were rigorously reviewing their approach to providing insurance protection to homes and businesses situated within flood affected areas.
277. The precise outcome of this review remains somewhat unclear. However it is broadly understood that those property owners who are situated above the 1.33% AEP (75 year)¹⁵ flood level will be able to secure insurance policies that will protect them against damages sustained in case of flooding.
278. There is a lack of clarity where properties are situated below this level, though it is understood that property owners will generally be protected against damages caused by a failure of the urban drainage system (i.e. drainage and/or sewer flooding). Insurance against river flooding may be provided in some areas, however premiums are likely to be considerable. Further information in this respect is available from the Association of British Insurers (ABI).

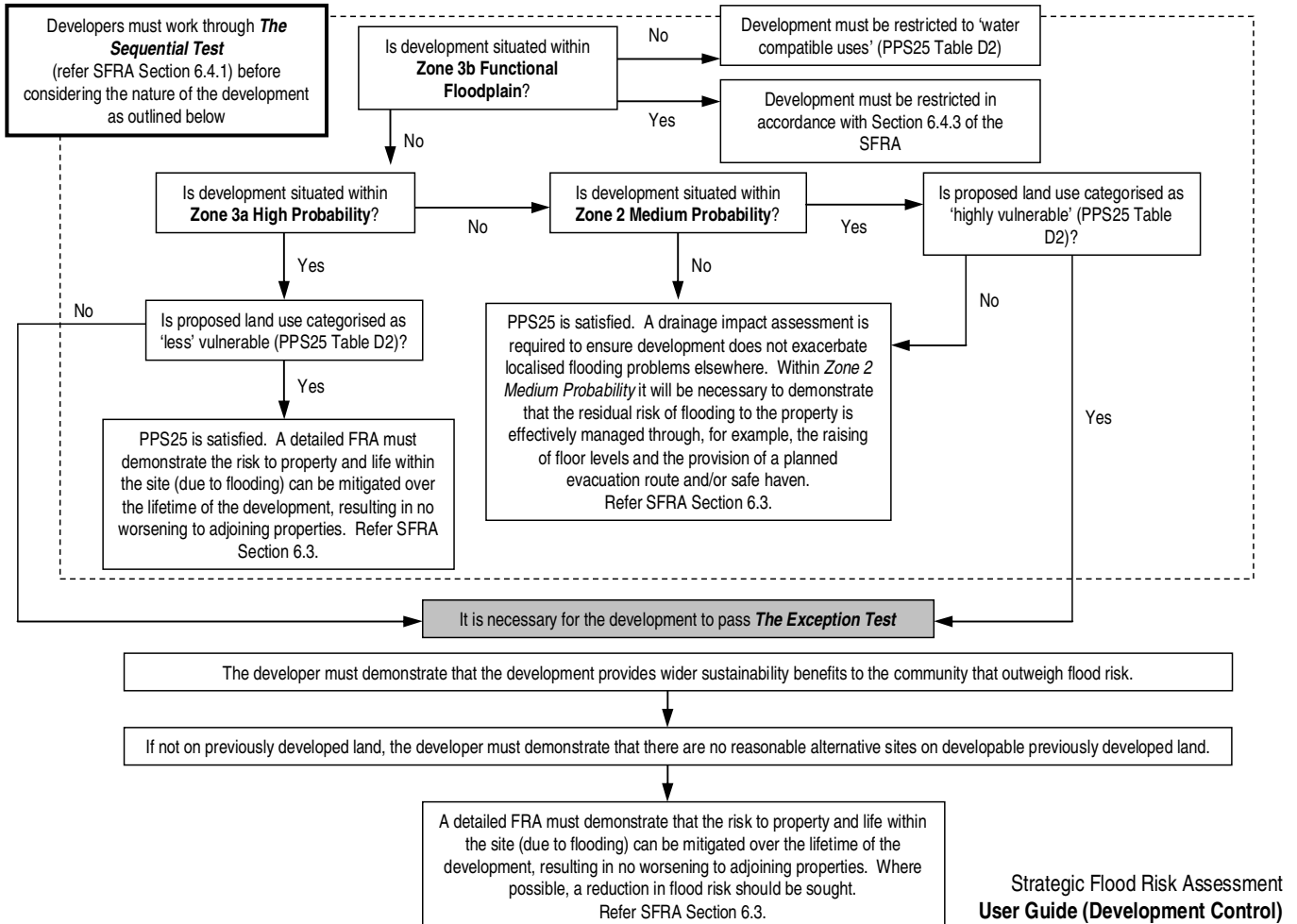
¹⁵ That is, the event that has a 1.33% probability of occurring in any one year. In other words, the event that will occur on average (or be exceeded) once every 75 years.

7 Conclusion & Recommendations

279. A considerable proportion of the Borough of Copeland is at risk of flooding. The risk of flooding posed to properties within the Borough arises from a number of sources including tidal, river flooding, localised runoff, sewer and groundwater flooding.
280. The Borough is characterised by its coastal location and a number of major river systems including the River Ehen, the River Keekle, Pow Beck and associated tributaries. The predominant mechanism for flooding is tidal. Much of the flooding is focussed on Whitehaven, which has been identified as a core centre of future anticipated growth.
281. A collation of potential sources of flood risk has been carried out in accordance with PPS25, developed in close consultation with both the Council and the Environment Agency. The Borough has been broken down into zones of 'high', 'medium' and 'low' probability of flooding in accordance with PPS25, providing the basis for the application of the PPS25 Sequential Test.
282. A planning solution to flood risk management should be sought wherever possible, steering vulnerable development away from areas affected by flooding in accordance with the PPS25 Sequential Test. Specific planning recommendations have been provided for all urban centres within the Borough (refer Section 6.5).
283. Where other planning considerations must guide the allocation of sites and the Sequential Test cannot be satisfied, specific recommendations have been provided to assist the Council and the developer to meet the Exception Test. These should be applied as development control conditions for all future development (refer Section 6.5).
284. Council policy is essential to ensure that the recommended development control conditions can be imposed consistently at the planning application stage. This is essential to achieve future sustainability within the Borough with respect to flood risk management. It is recommended that future revision to Council policy are developed in light of the suggested development control conditions presented by the Copeland SFRA.
285. Emergency planning is imperative to minimise the risk to life posed by flooding within the Borough. It is recommended that the Council review their adopted flood risk response plan in light of the findings and recommendations of the SFRA. It is also vital to ensure that spatial planning supports flood risk management policies and emergency planning.
286. The core data used to underpin the development of the SFRA will be superseded over time as the Environment Agency provides further investment in detailed modelling of the Borough's watercourses, reviewing its Flood Zone Maps on a quarterly basis. It is recommended that the Environment Agency Flood Zone Maps are retained as the 'first pass' filter at the development application stage, triggering (or otherwise) the need for a more detailed site-based investigation.
287. The SFRA should be retained as a 'living document', reviewed on a regular basis in light of better flood risk information and emerging policy guidance.

Appendix A
Copeland Borough Council SFRA
User Guide

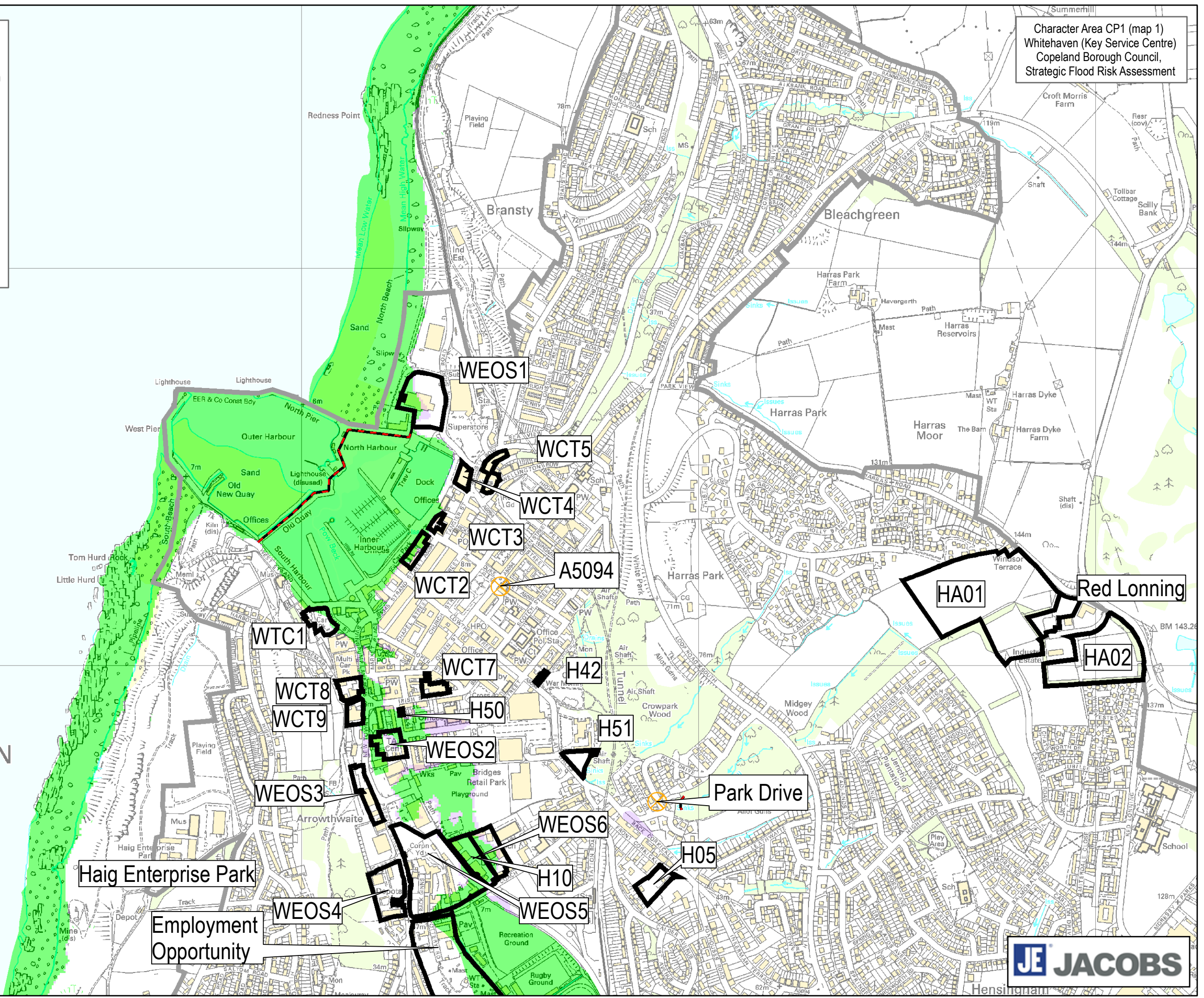




Appendix B

Character Area Maps

- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary

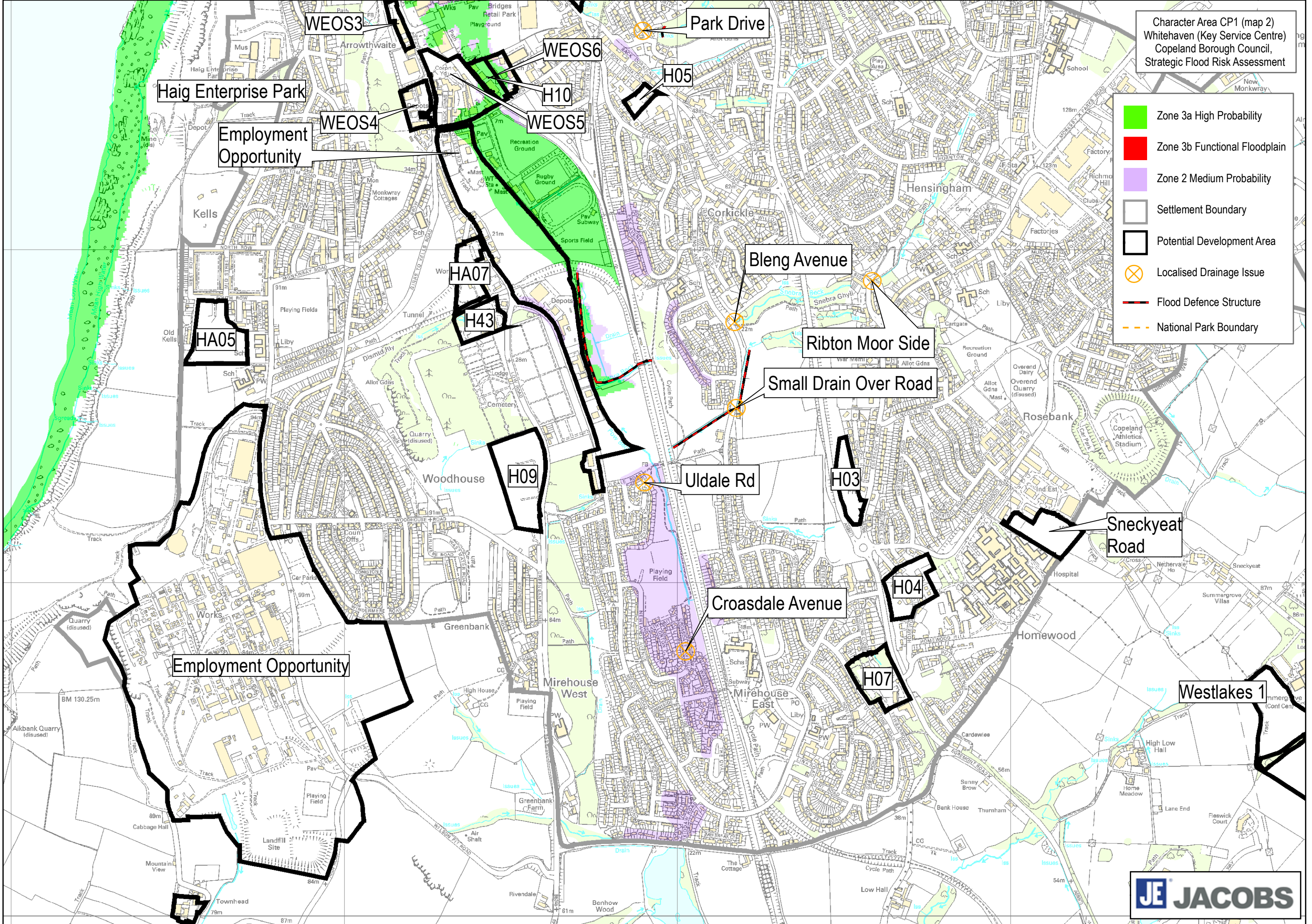


WHITEHAVEN



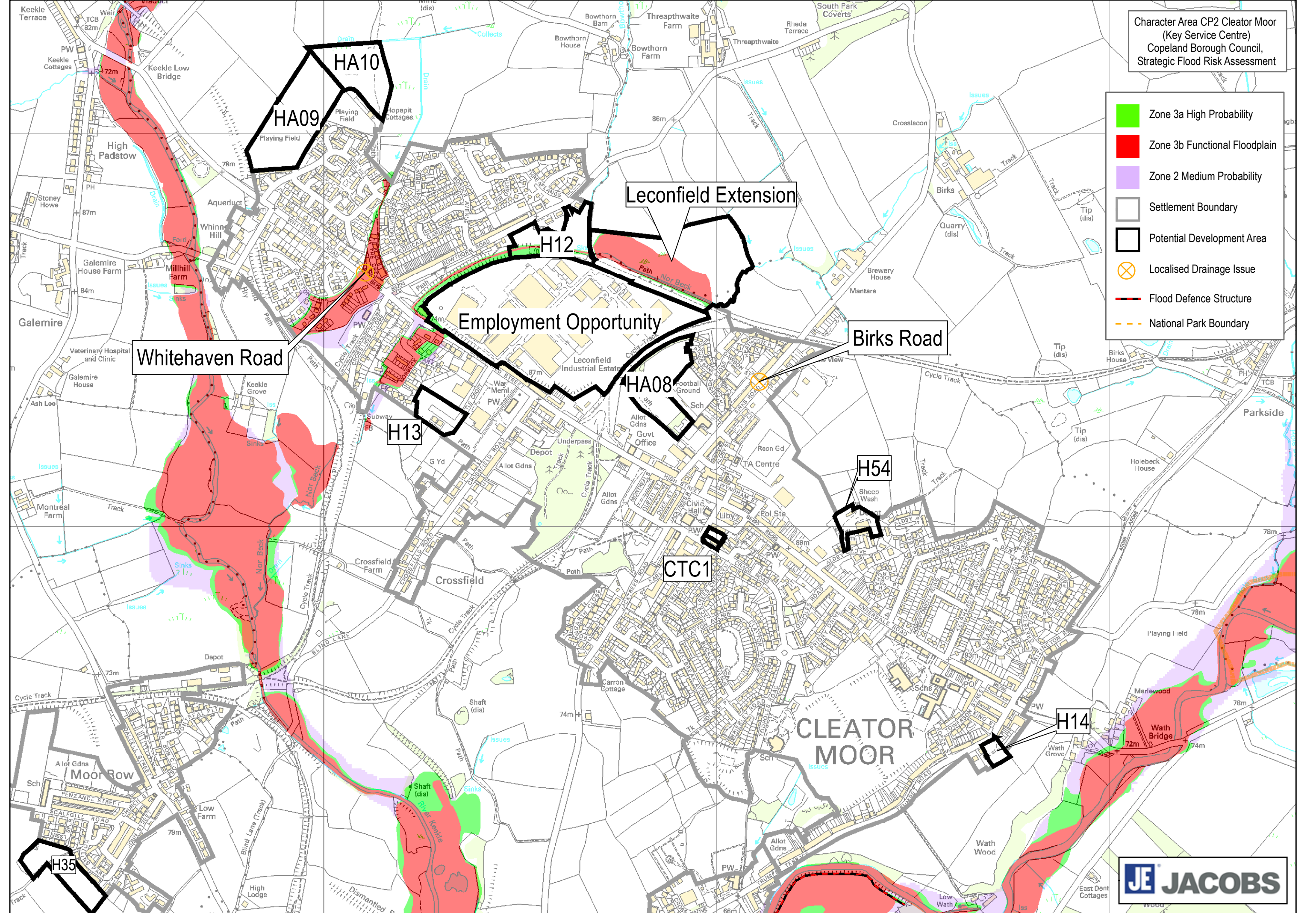
Character Area CP1 (map 2)
Whitehaven (Key Service Centre)
Copeland Borough Council,
Strategic Flood Risk Assessment

- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary



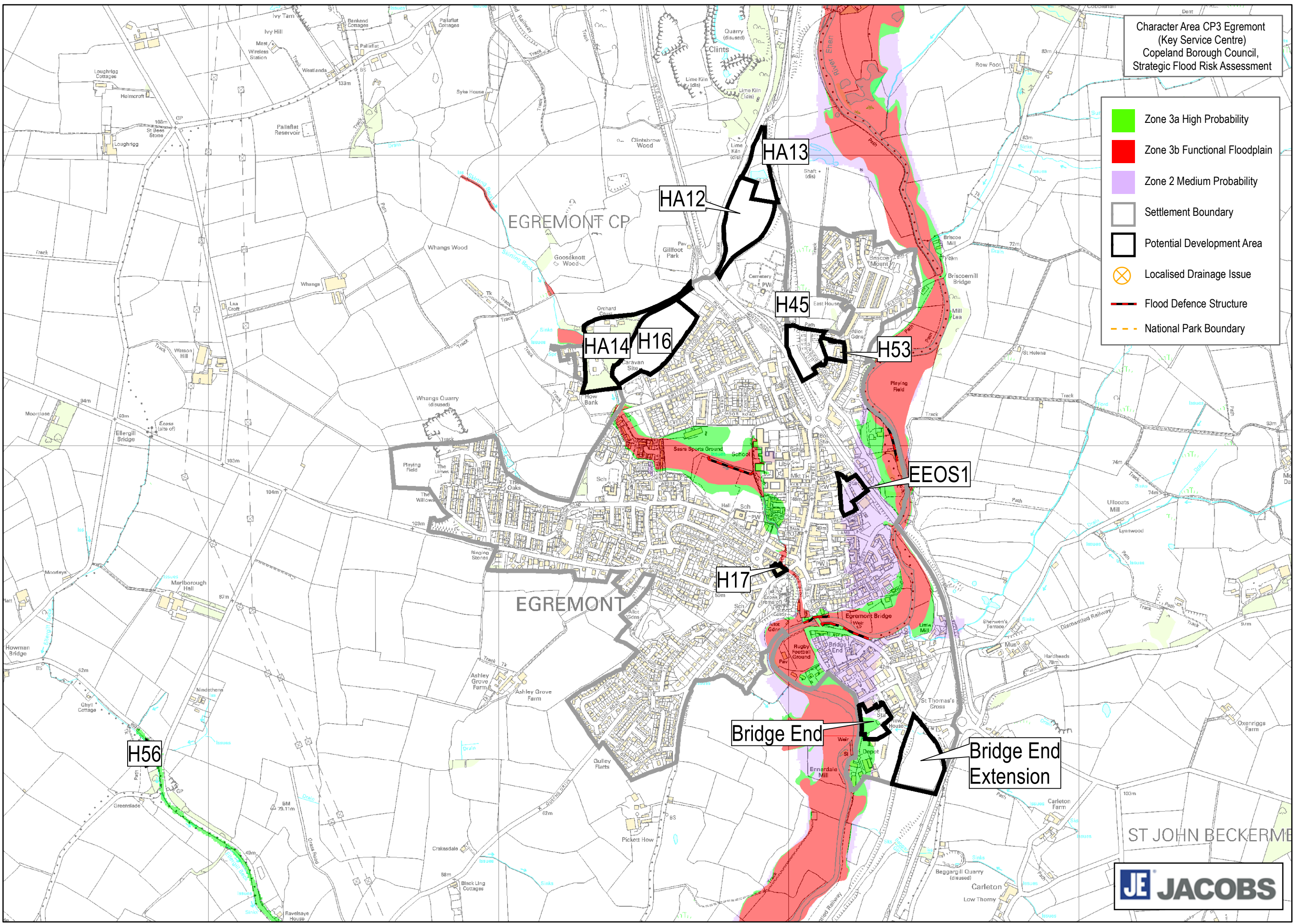
Character Area CP2 Cleator Moor
(Key Service Centre)
Copeland Borough Council,
Strategic Flood Risk Assessment

- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary

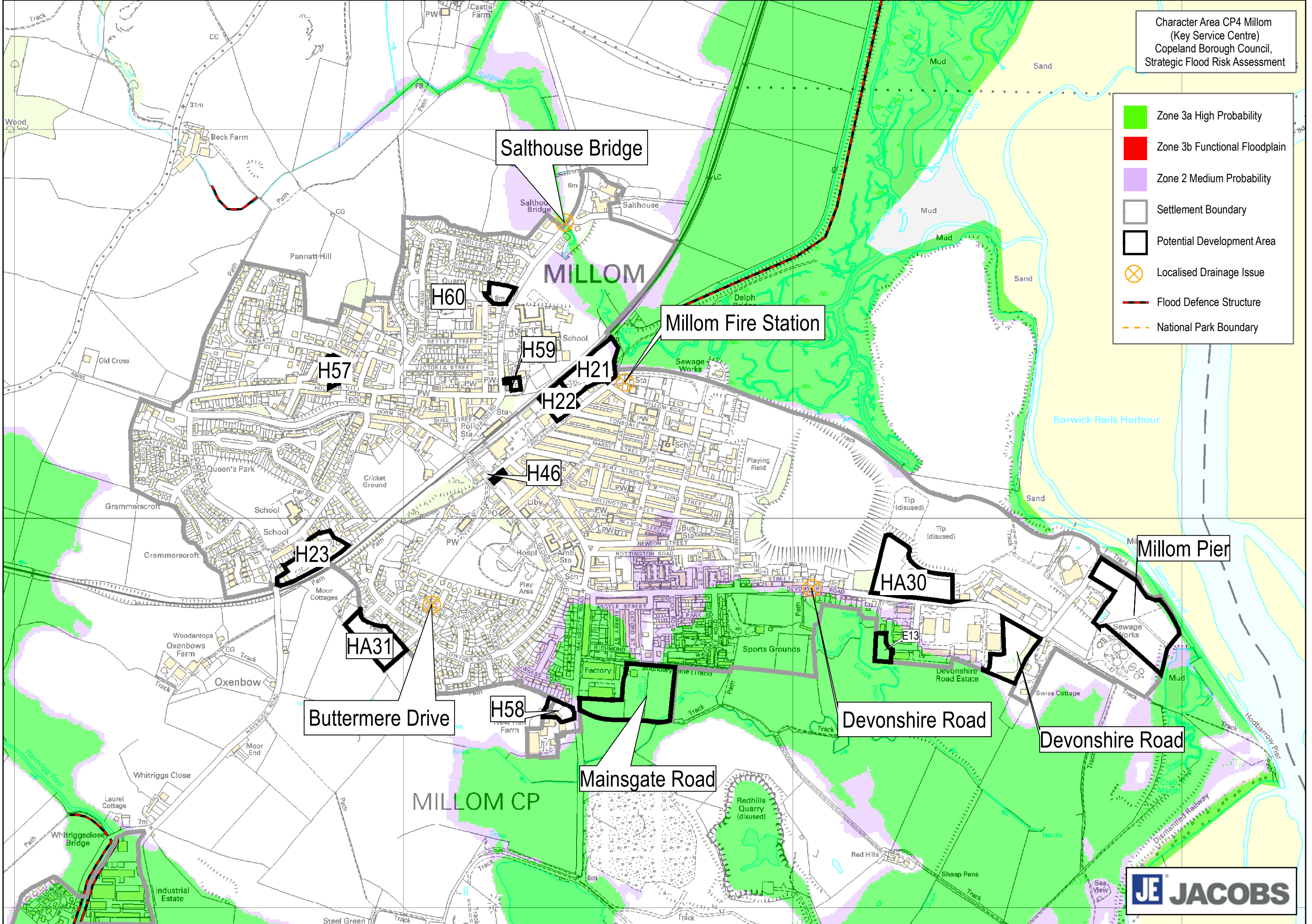


Character Area CP3 Egremont
 (Key Service Centre)
 Copeland Borough Council,
 Strategic Flood Risk Assessment

- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary

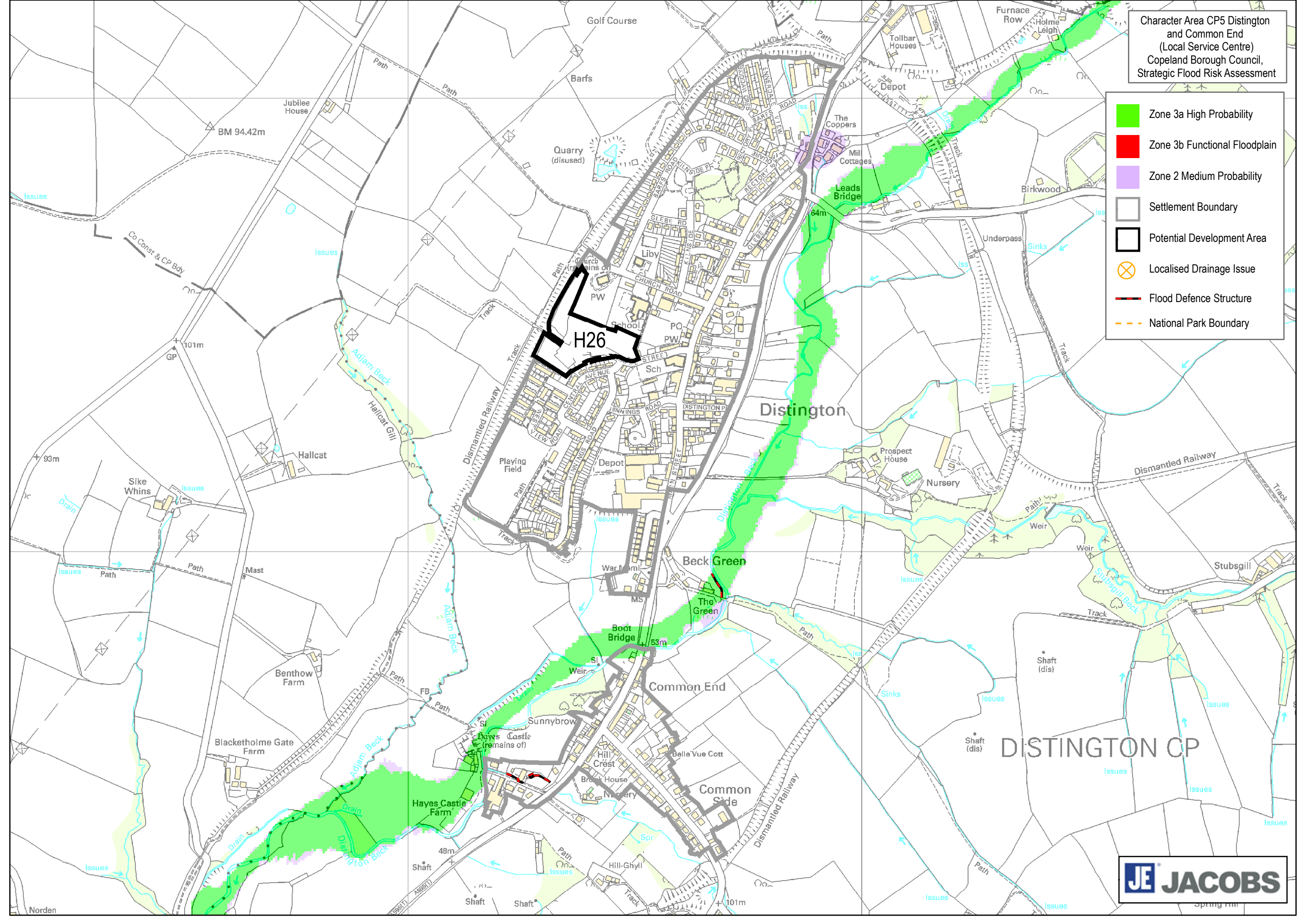


- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary

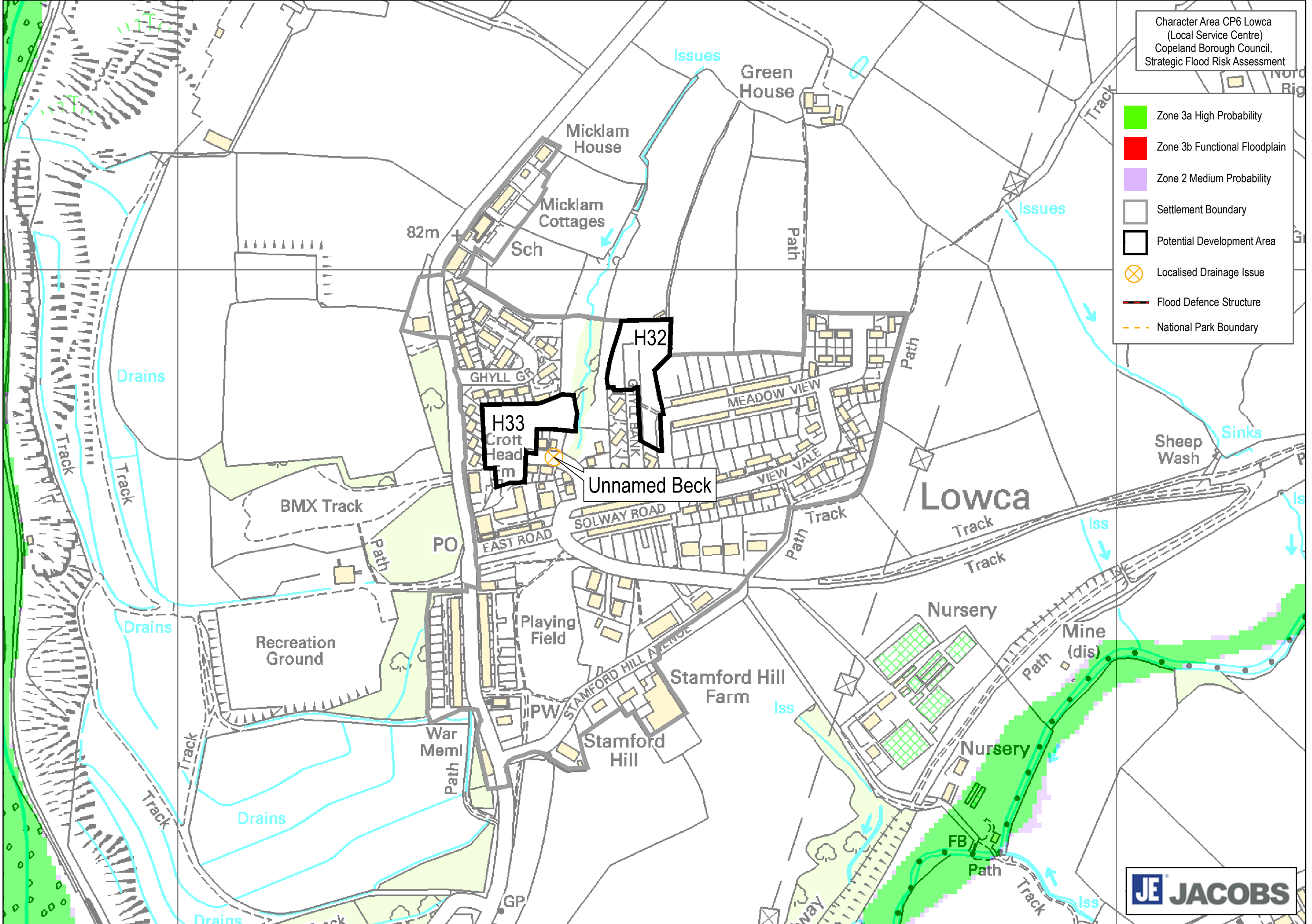










Character Area CP5 Distington and Common End (Local Service Centre)
 Copeland Borough Council,
 Strategic Flood Risk Assessment

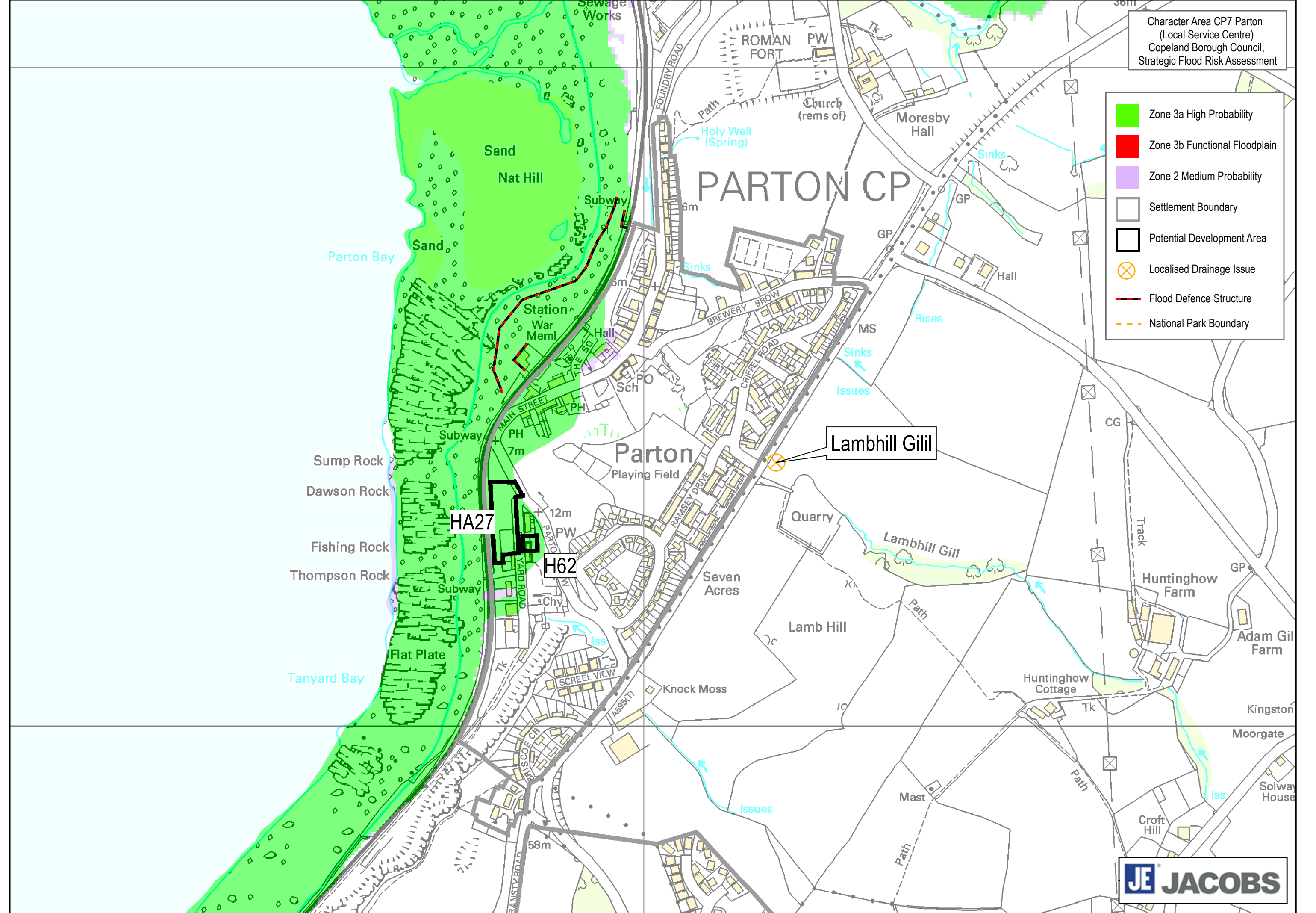
- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary



- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary

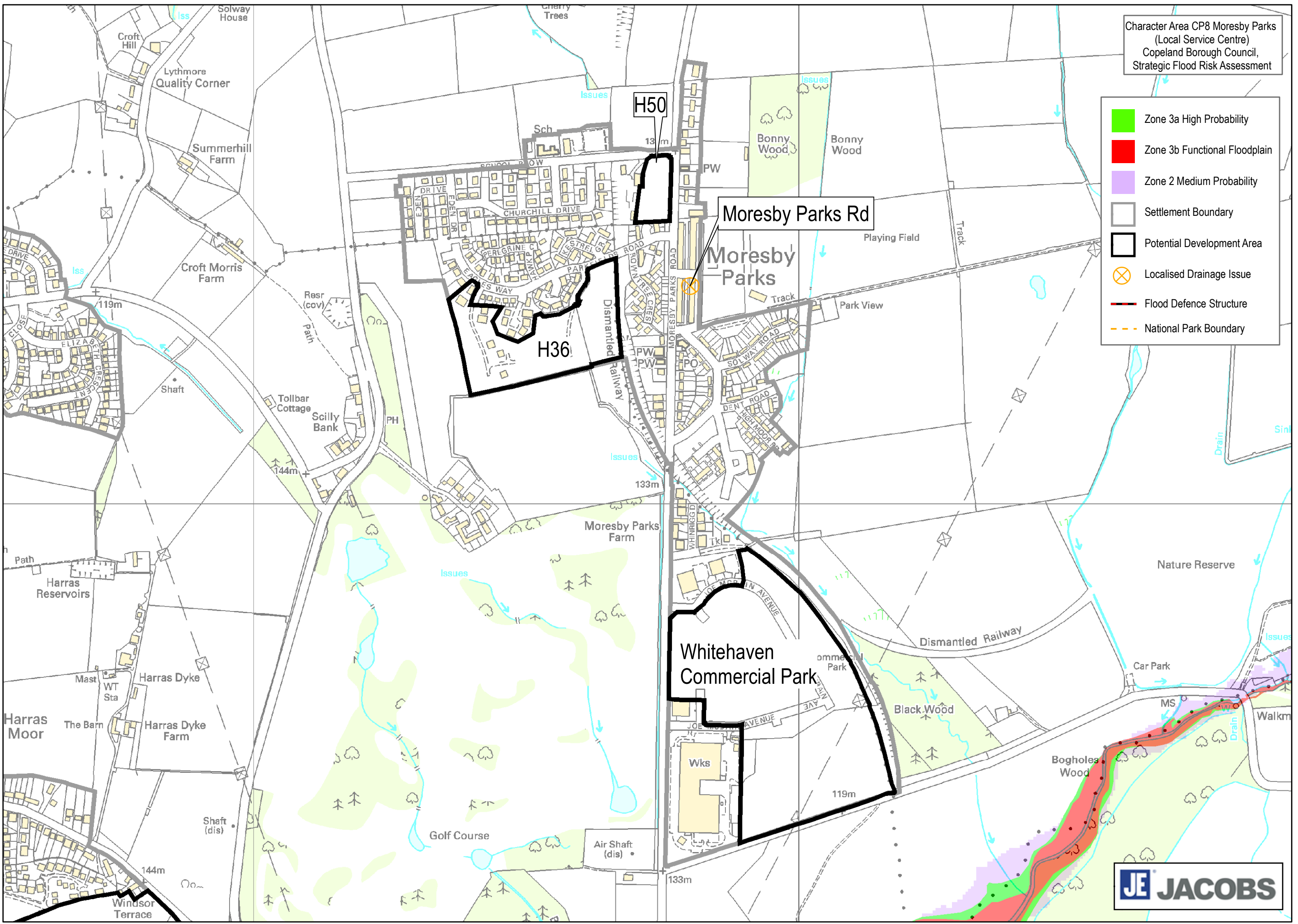


	Zone 3a High Probability
	Zone 3b Functional Floodplain
	Zone 2 Medium Probability
	Settlement Boundary
	Potential Development Area
	Localised Drainage Issue
	Flood Defence Structure
	National Park Boundary

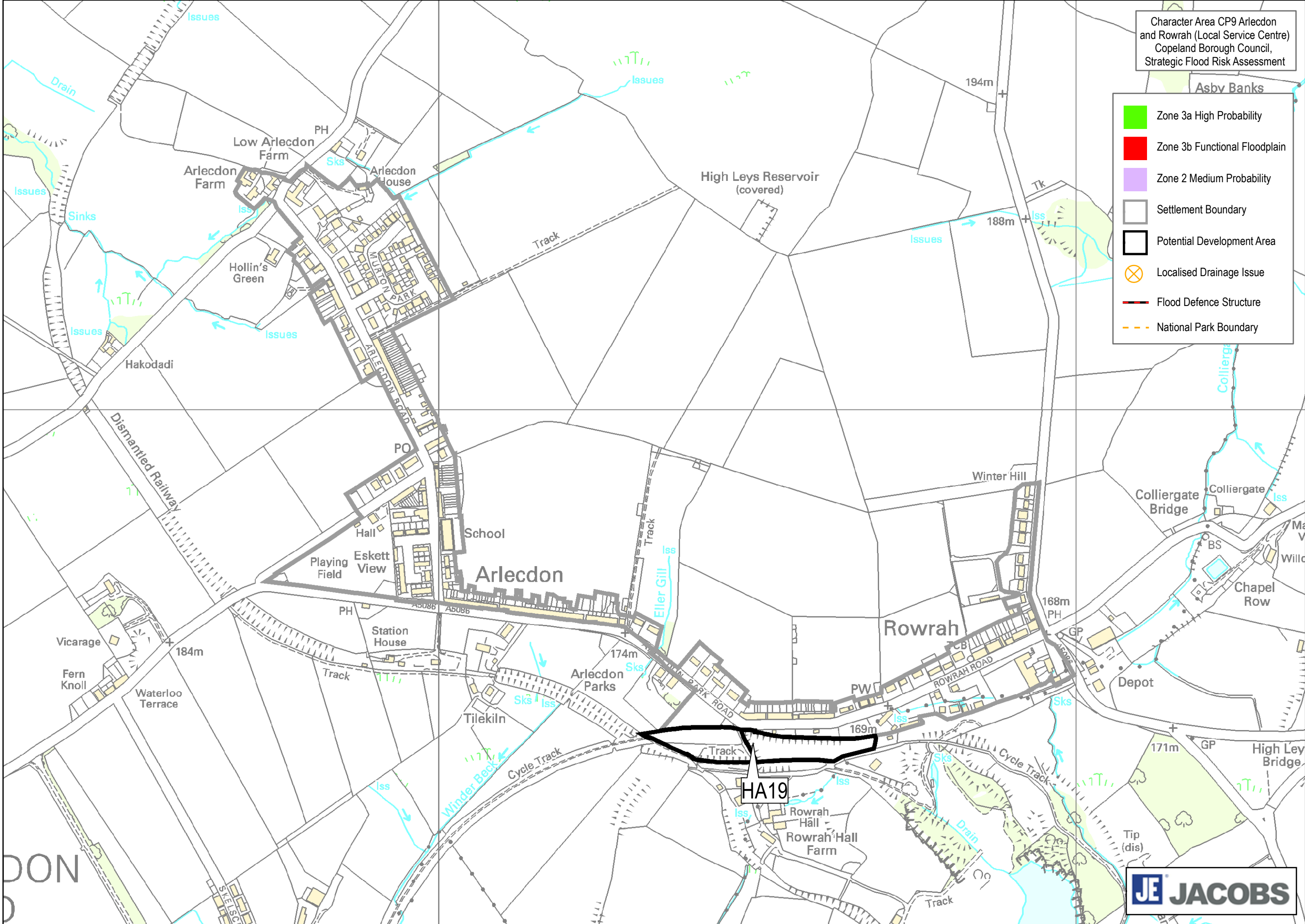


Character Area CP8 Moresby Parks
 (Local Service Centre)
 Copeland Borough Council,
 Strategic Flood Risk Assessment

- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary



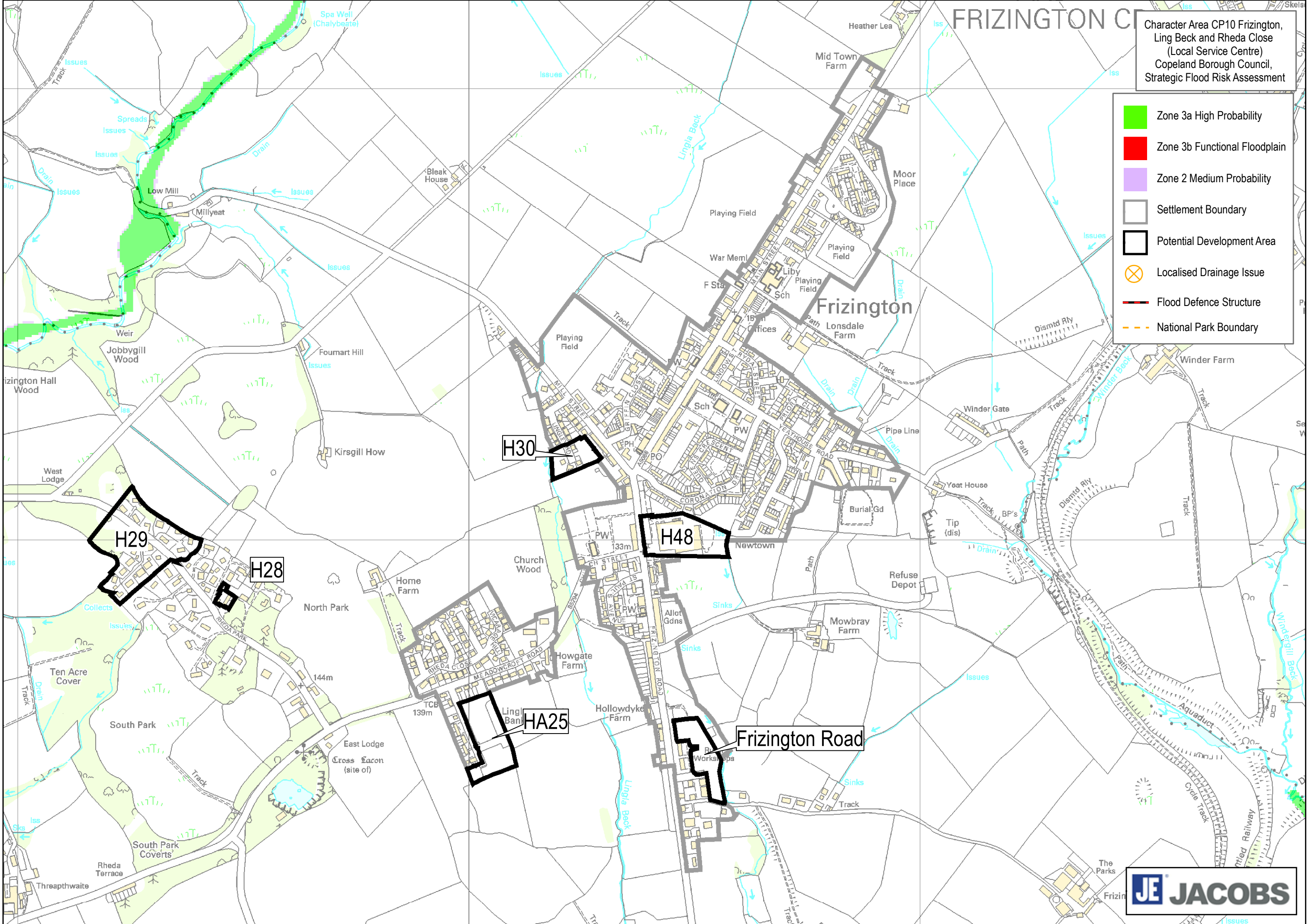
- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary



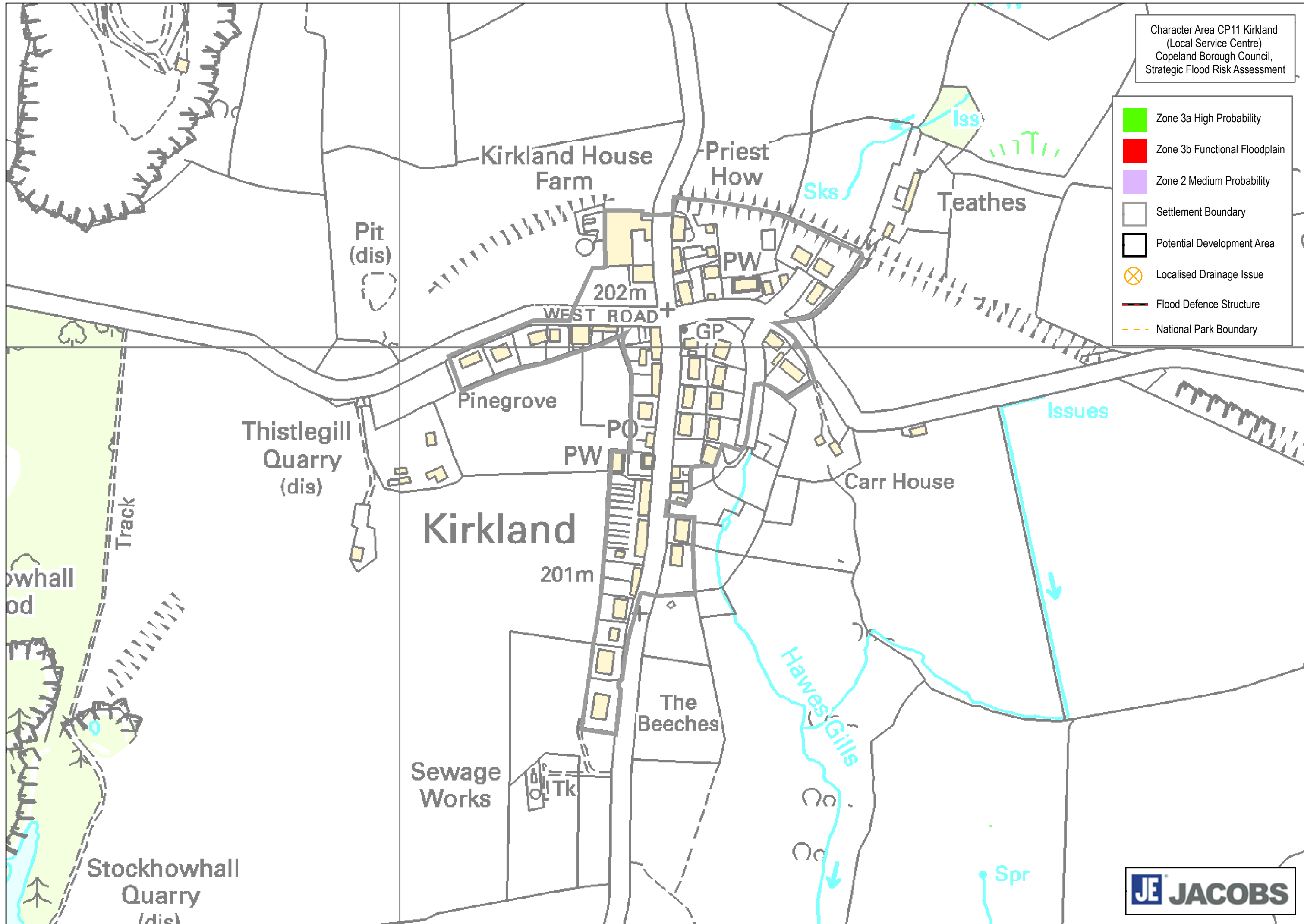
FRIZINGTON C

Character Area CP10 Frizington,
Ling Beck and Rheda Close
(Local Service Centre)
Copeland Borough Council,
Strategic Flood Risk Assessment

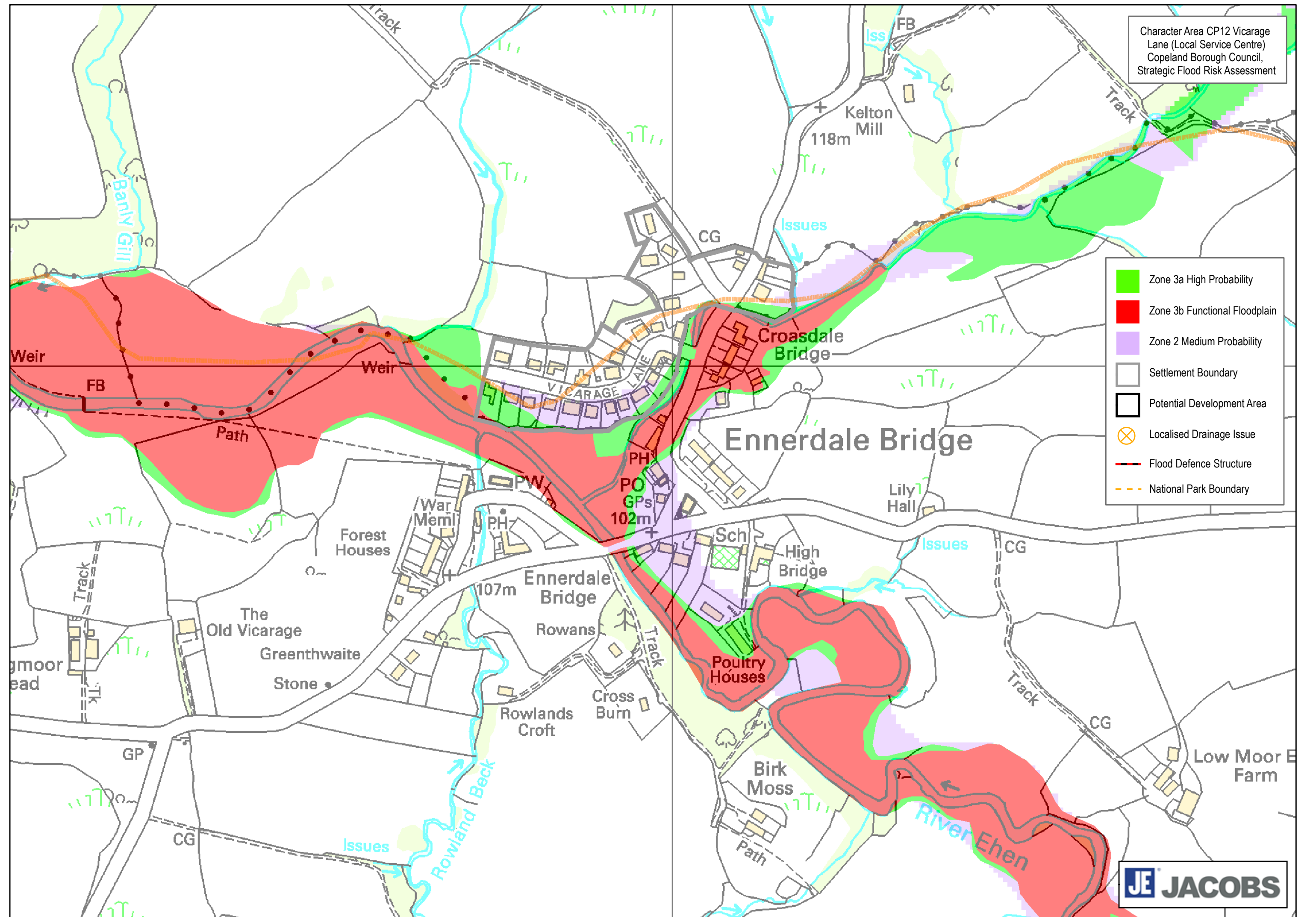
- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary



- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- ⊗ Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary

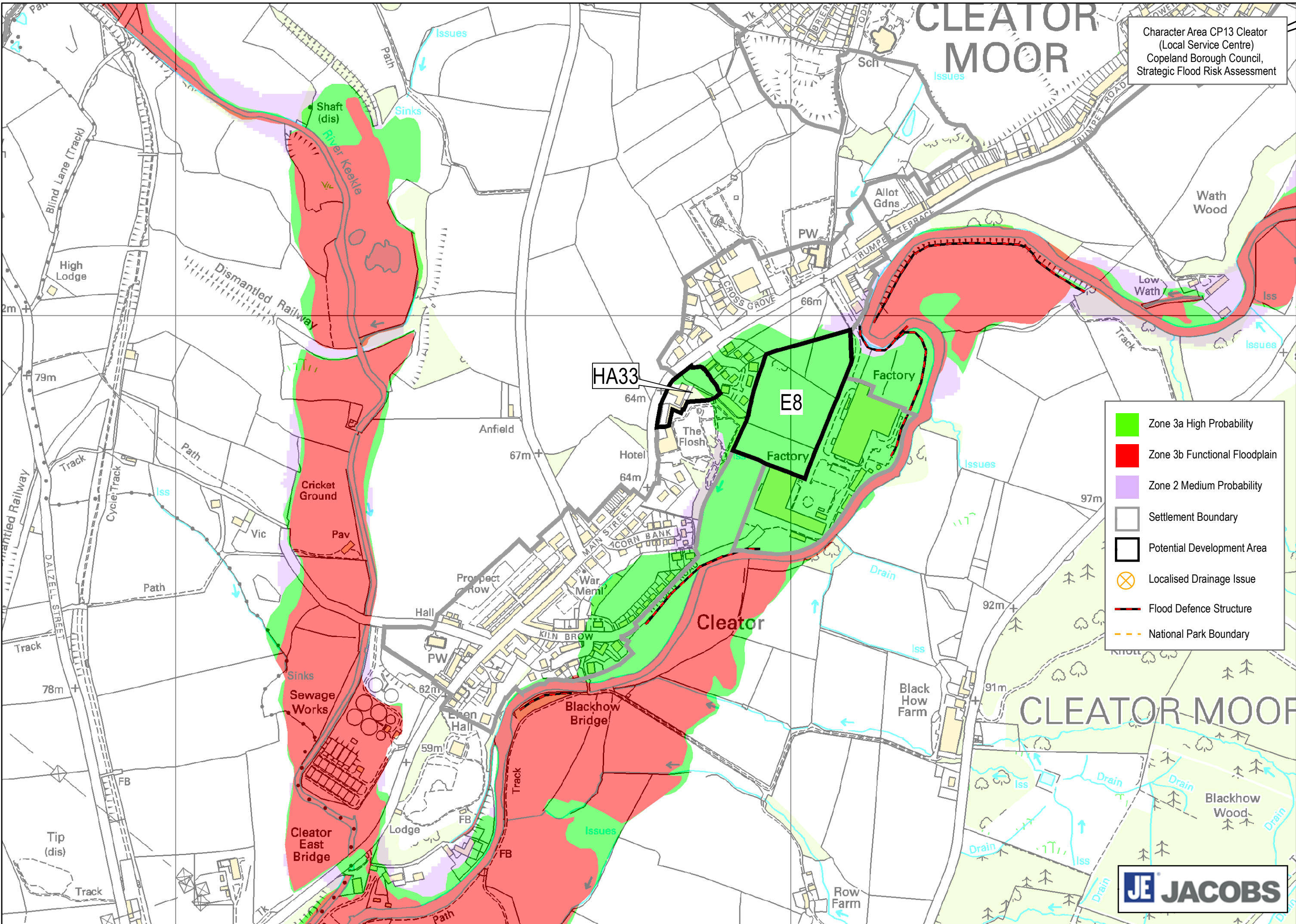


- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary

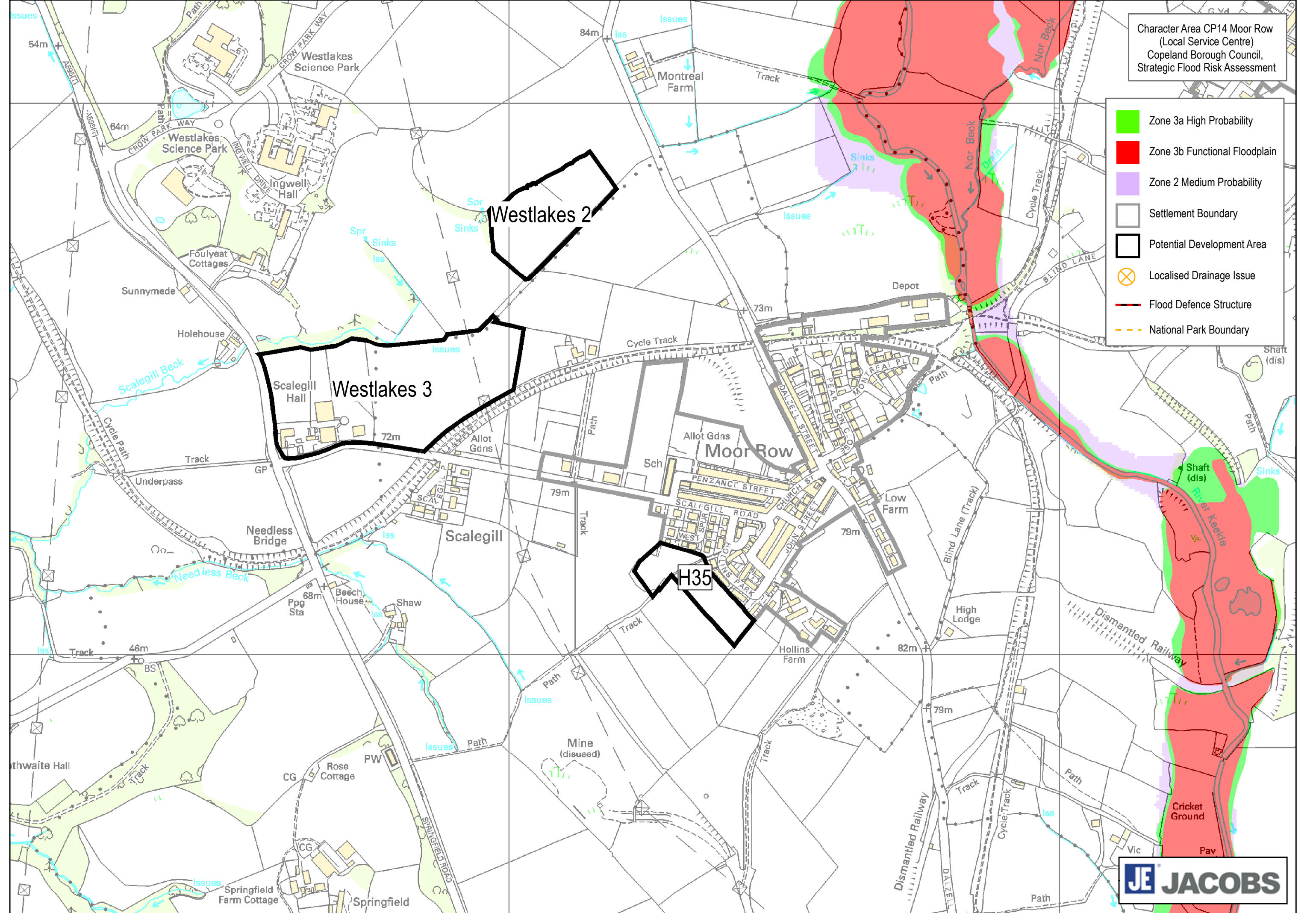


CLEATOR MOOR

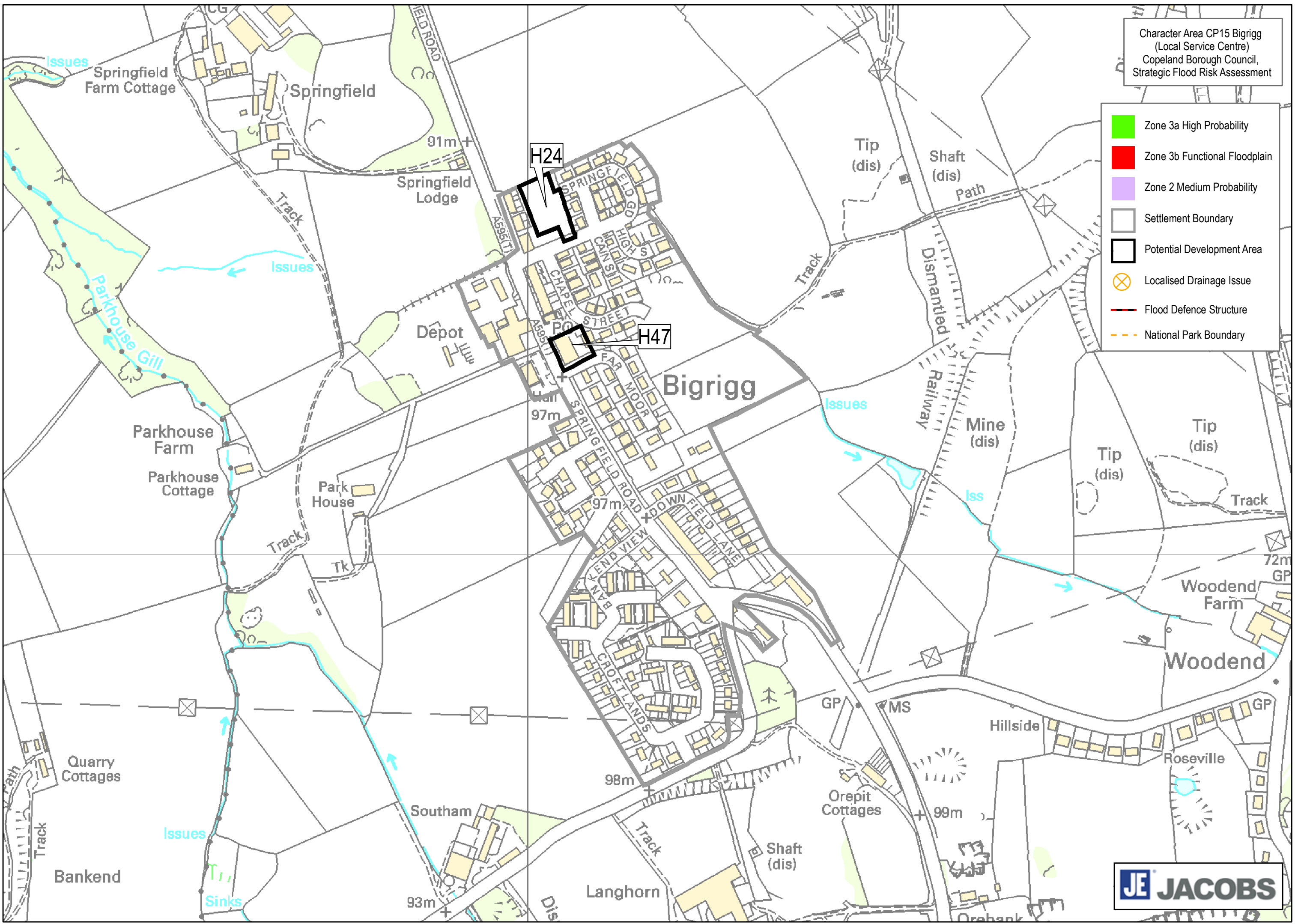
Character Area CP13 Cleator
(Local Service Centre)
Copeland Borough Council,
Strategic Flood Risk Assessment



- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary

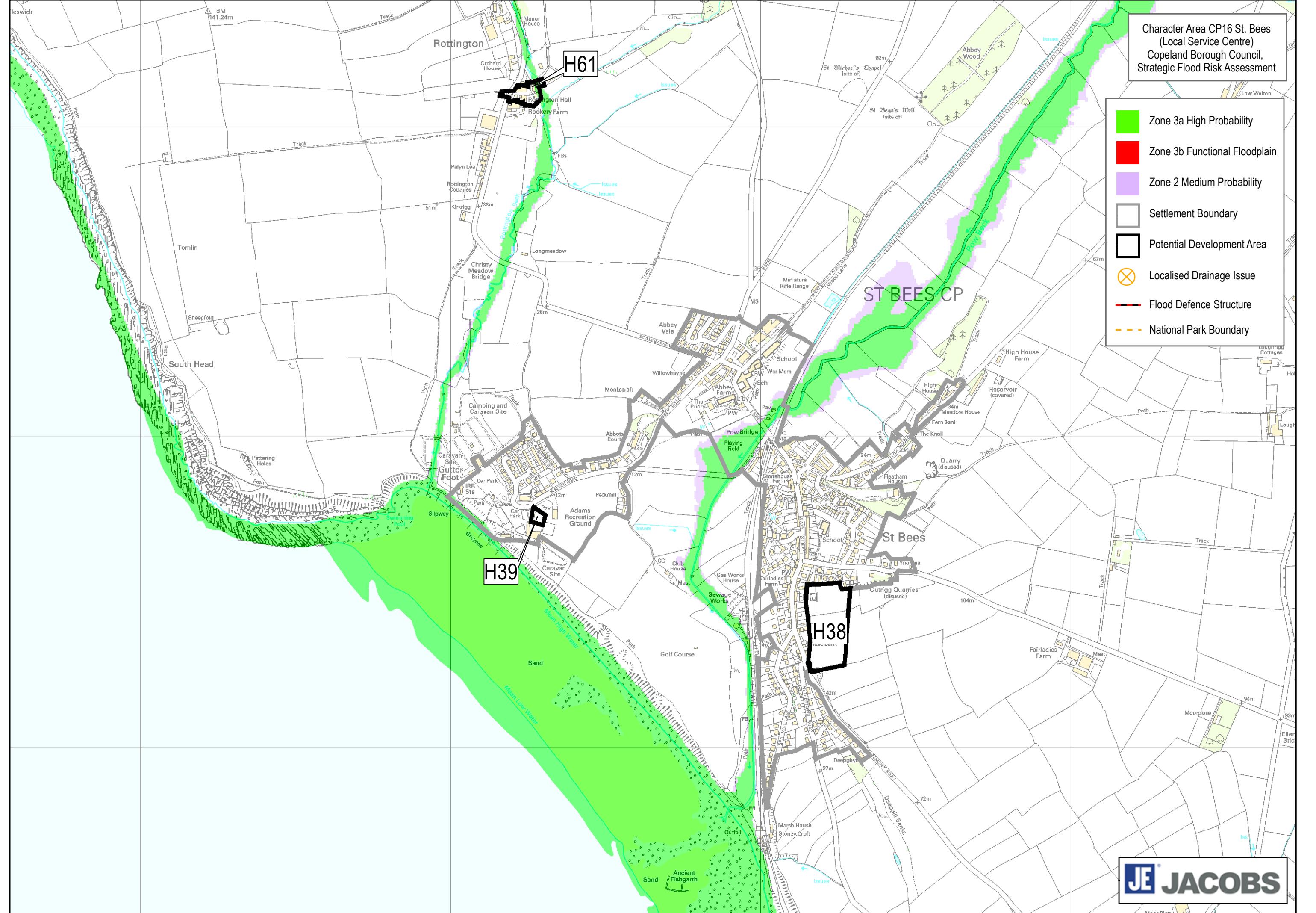


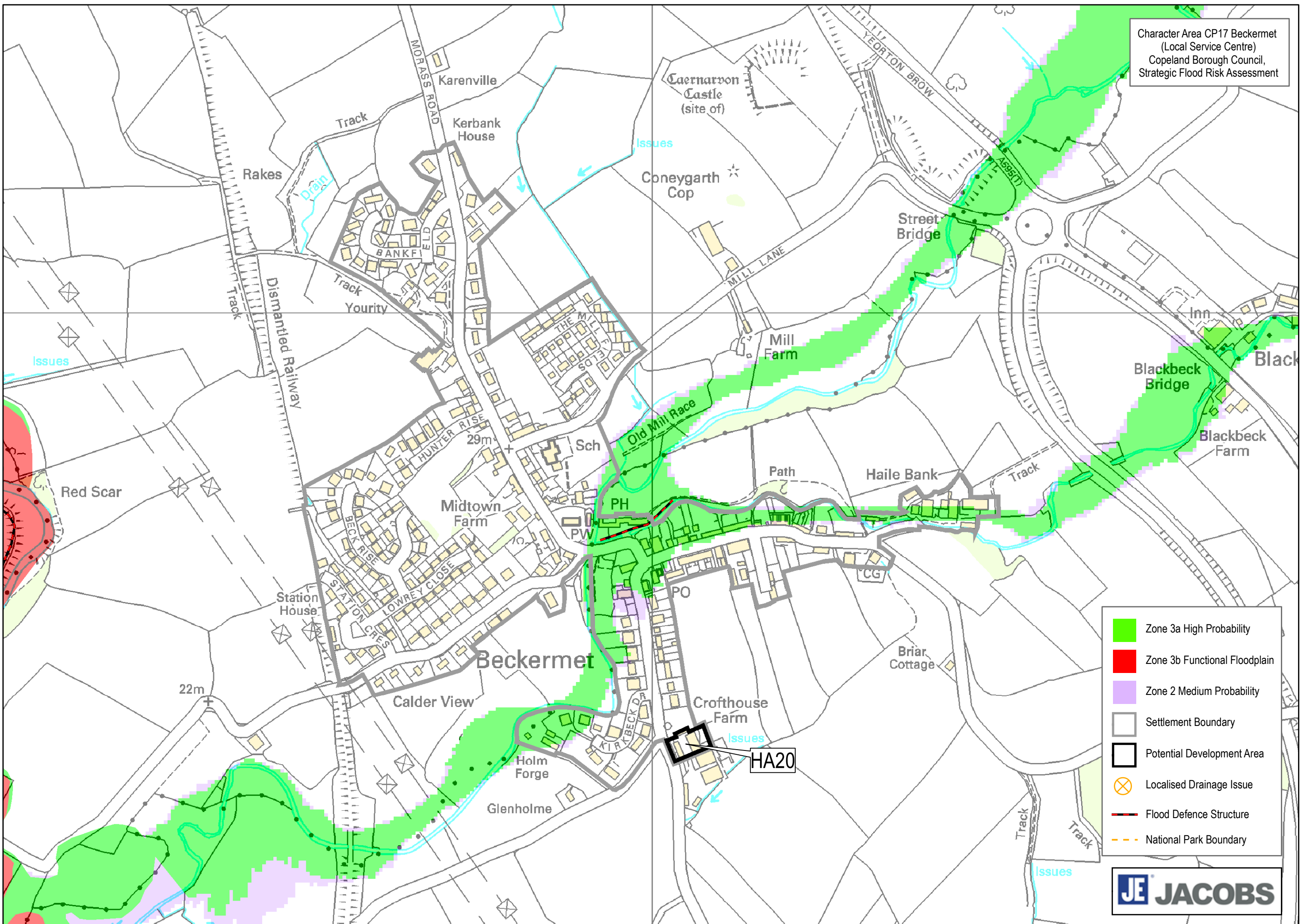
- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary



Character Area CP16 St. Bees
 (Local Service Centre)
 Copeland Borough Council,
 Strategic Flood Risk Assessment

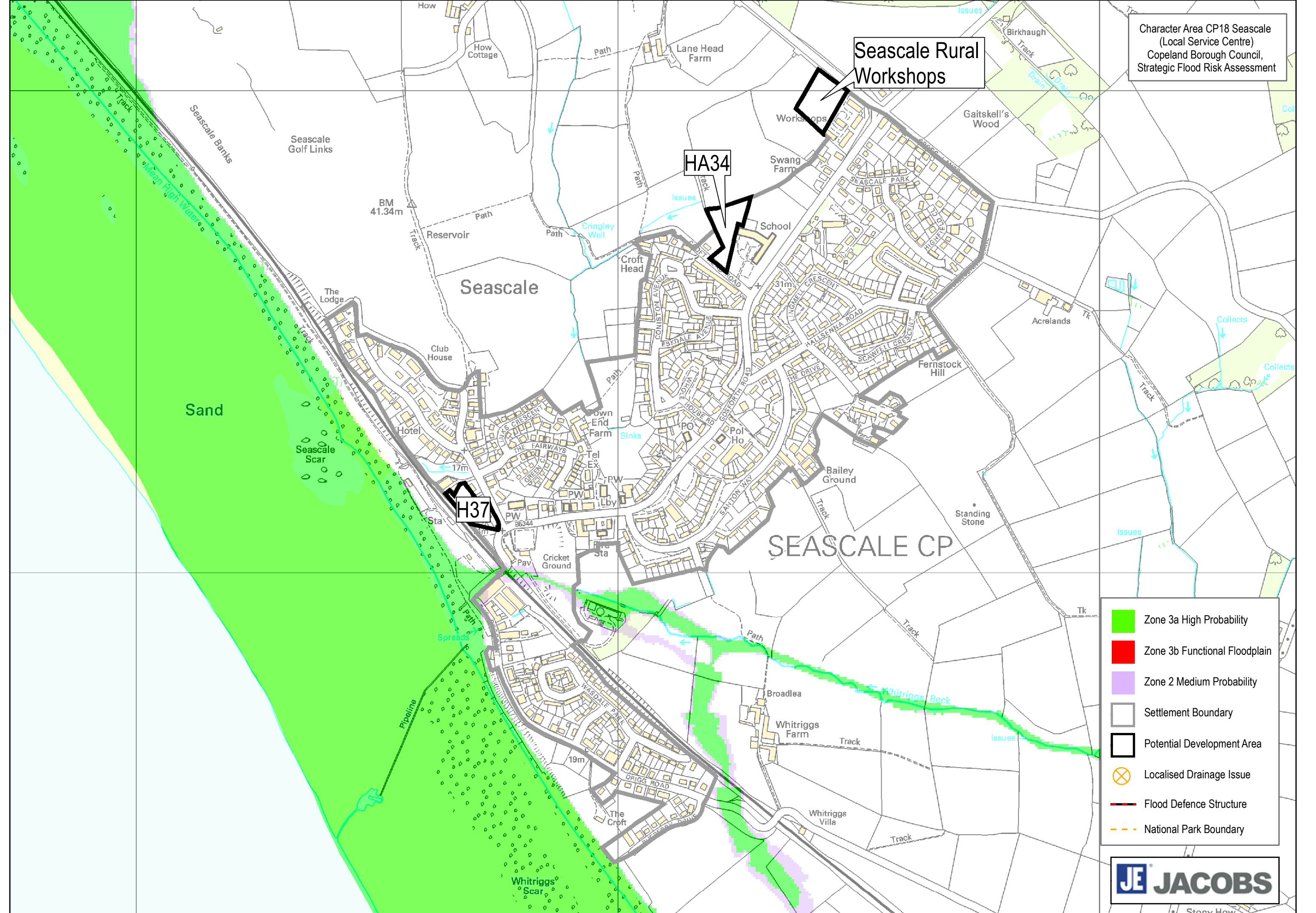
- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary





- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- X Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary





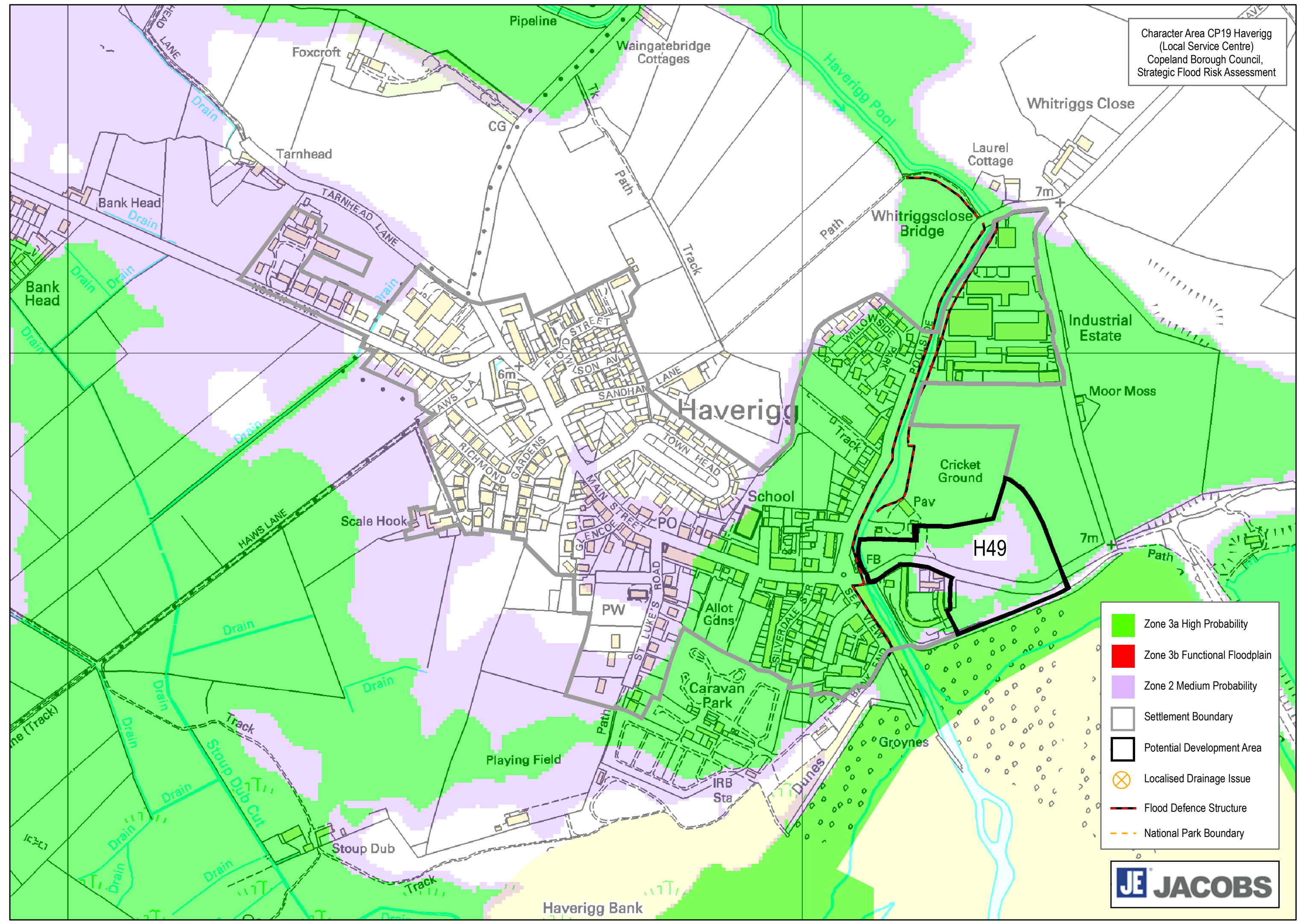
Seascale Rural Workshops

HA34

H37

- Zone 3a High Probability
- Zone 3b Functional Floodplain
- Zone 2 Medium Probability
- Settlement Boundary
- Potential Development Area
- Localised Drainage Issue
- Flood Defence Structure
- National Park Boundary





Appendix C
Tables D1, D2 & D3 from PPS25

Table D.1: Flood Zones

(Note: These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 Low Probability

Definition

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

Appropriate uses

All uses of land are appropriate in this zone.

FRA requirements

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA. This need only be brief unless the factors above or other local considerations require particular attention. See Annex E for minimum requirements.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

Zone 2 Medium Probability

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Appropriate uses

The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure in Table D.2 are appropriate in this zone.

Subject to the Sequential Test being applied, the highly vulnerable uses in Table D.2 are only appropriate in this zone if the Exception Test is passed.

FRA requirements

All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage techniques.

Zone 3a High Probability

Definition

This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses

The water-compatible and less vulnerable uses of land in Table D.2 are appropriate in this zone. The highly vulnerable uses in Table D.2 should not be permitted in this zone.

The more vulnerable and essential infrastructure uses in Table D.2 should only be permitted in this zone if the Exception Test (see para. D.9) is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

FRA requirements

All development proposals in this zone should be accompanied by a FRA. See Annex E for minimum requirements.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- ii. relocate existing development to land in zones with a lower probability of flooding; &
- iii. create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b The Functional Floodplain

Definition

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

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in Table D.2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

FRA requirements

All development proposals in this zone should be accompanied by a FRA.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- i. reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and
- ii. relocate existing development to land with a lower probability of flooding.

Table D.2: Flood Risk Vulnerability Classification

Essential Infrastructure

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

Highly Vulnerable

- Police stations, Ambulance stations and Fire stations and
- Command Centres and 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.

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.**

Less Vulnerable

- 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'; 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 plants.
- Sewage treatment plants (if adequate pollution control measures are in place).

Water-compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel workings.
- Docks, marinas and wharves.
- Navigation facilities.
- MOD 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.**

Table D.3: Flood Risk Vulnerability and Flood Zone ‘Compatibility’

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see Table D.1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	x	Exception Test required	✓
	Zone 3b ‘Functional Floodplain’	Exception Test required	✓	x	x	x

Key:

✓ Development is appropriate

x Development should not be permitted