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Redcar & Cleveland Borough Council Level 1 Strategic Flood Risk Assessment Update

Final Report

May 2016

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Contract

This report describes work commissioned by Roger Tait, on behalf of Redcar and Cleveland Borough Council, by an email dated 14 December 2015. Redcar and Cleveland Borough Council’s representative for the contract was Roger Tait and Mike Williamson of JBA Consulting carried out this work.

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Purpose

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Executive Summary

This Level 1 Strategic Flood Risk Assessment (SFRA) updates the previous Level 1 assessment published in 2010 using up-to-date flood risk information together with the most current flood risk and planning policy available from the National Planning Policy Framework¹ (NPPF) and Flood Risk and Coastal Change Planning Practice Guidance² (FRCC-PPG). RCBC require this update to initiate the sequential risk-based approach to the allocation of land for development and to identify whether application of the Exception Test is likely to be necessary. This will help to inform and to provide the evidence base for their new Local Plan land allocations and Detailed Policies.

RCBC provided their latest potential development sites data and information. An assessment of flood risk to all sites is provided to assist RCBC in their decision making process for sites to take forward as part of their new Local Plan.

The aims and objectives of this SFRA update are:

- To form part of the evidence base and inform the Sustainability Appraisal (Incorporating the Strategic Environmental Assessment) for the council's new Local Plan.
- To reflect current national policy documentation including the NPPF and its accompanying Flood Risk and Coastal Change Planning Practice Guidance to enable RCBC to meet its obligations as defined by the NPPF.
- To supplement current policy guidelines and to provide a straightforward risk based approach to development management in the area.
- To make recommendations on the suitability of potential development sites based on flood risk for RCBC's new Local Plan.
- To understand current flood risk from all sources and any historic and future flood risk information to enable investigation and identification of the extent and severity of flood risk throughout the borough. This assessment will enable RCBC to steer development away from those areas where flood risk is considered greatest, ensuring that areas allocated for development can be developed in a safe, cost effective and sustainable manner.
- To provide guidance for developers and planning officers on planning requirements.
- To pay particular attention to surface water flood risk, using the Environment Agency's third generation updated Flood Map for Surface Water (uFMfSW).
- To provide a reference document (this report) to which all parties involved in development planning and flood risk can reliably turn, for initial advice and guidance.
- To develop a report that forms the basis of an informed development management process that also provides guidance on the potential risk of flooding associated with future planning applications and the basis for site-specific Flood Risk Assessments (FRAs) where necessary.
- To provide a suite of interactive GeoPDF flood risk maps illustrating the interaction between flood risk and potential development sites.
- To identify land required for current and future flood management that could be safeguarded from development as set out in the NPPF.

1 <http://planningguidance.planningportal.gov.uk/blog/policy/>

2 <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

A number of potential development sites are shown to be at varying risk from fluvial, tidal, surface water flooding and residual risk. Table 1-1 summarises the number of sites at risk from each flood zone as per the Environment Agency's Flood Map for Planning (Rivers and Sea).

Table 1-1: Number of Potential Development Sites at Risk from Flood Map for Planning (Rivers and Sea) Flood Zones

Potential Development Sites	Number of Sites Within		
	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Residential	6	6	6
Employment Land Available	5	3	1
Employment Land Developed	9	8	3
Industrial Estate	11	10	3
Traveller	1	1	1
Mixed Use	1	1	1
TOTAL	33	29	15

Recommendations, in Section 6.5 of this report, are made for each site at risk, broadly entailing the following:

- Consider withdrawing site based on level of flood risk;
- Exception Test required if site passes Sequential Test;
- Consider site layout and design if site passes Sequential Test;
- Site-specific FRA required; and
- Site permitted due to small perceived flood risk, subject to consultation with the LPA / LLFA.

Out of the 295 sites provided for assessment by RCBC, 15 are within or partially within the functional floodplain (Flood Zone 3b). Out of these 15 sites, 4 are recommended for withdrawal where the level of risk is considered too great for development to proceed. There are a further 5 sites that are recommended for withdrawal based on significant surface water flood risk.

Included along with this report as part of the SFRA are:

- Detailed interactive GeoPDF maps showing all available flood risk information overlaid with the potential development sites - Appendix A; and
- Development Site Assessment spreadsheet detailing the risk to each site with recommendations on development - Appendix B.

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Abbreviations

ABD.....	Areas Benefitting from Defences
AEP.....	Annual Exceedance Probability
AIMS.....	Asset Information Management System
AStGWF.....	Areas Susceptible to Groundwater Flooding
CC.....	Climate change
CCA.....	Civil Contingencies Act
CDA.....	Critical Drainage Area
CEPU.....	Cleveland Emergency Planning Unit
CFMP.....	Catchment Flood Management Plan
CIL.....	Community Infrastructure Levy
CSO.....	Combined Sewer Overflow
DCLG.....	Department for Communities and Local Government
DPD.....	Development Plan Documents
DTM.....	Digital Terrain Model
EA.....	Environment Agency
FAA.....	Flood Alert Area
FAS.....	Flood Alleviation Scheme
FCDPAG.....	Flood and Coastal Defence Project Appraisal Guidance
FCERM.....	Flood and Coastal Erosion Risk Management Network
FDGiA.....	Flood Defence Grant in Aid
FEH.....	Flood Estimation Handbook
FRA.....	Flood Risk Assessment
FRCC-PPG.....	Flood Risk and Coastal Change Planning Practice Guidance
FRM.....	Flood Risk Management
FRMP.....	Flood Risk Management Plan
FRMS.....	Flood Risk Management Strategy
FRR.....	Flood Risk Regulations
FWA.....	Flood Warning Area
FWMA.....	Flood and Water Management Act
GI.....	Green Infrastructure
GIS.....	Geographical Information Systems
HFM.....	Historic Flood Map
IDB.....	Internal Drainage Board
LA.....	Local Authority
LDF.....	Local Development Framework
LFRMS.....	Local Flood Risk Management Strategy
LLFA.....	Lead Local Flood Authority
LPA.....	Local Planning Authority

LRF	Local Resilience Forum
MAFRP	Multi-Agency Flood Response Plan
NGO	Non-Governmental Organisation
NPPF	National Planning Policy Framework
PCPA	Planning and Compulsory Purchase Act
PFRA	Preliminary Flood Risk Assessment
RBD	River Basin District
RBMP.....	River Basin Management Plan
RCBC.....	Redcar and Cleveland Borough Council
RoFRS	Risk of Flooding from Rivers and Sea
RMA	Risk Management Authority
RSS.....	Regional Spatial Strategy
SA	Sustainability Appraisal
SEA.....	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SoP	Standard of Protection
SPD.....	Supplementary Planning Documents
SuDS.....	Sustainable Drainage Systems
SWMP.....	Surface Water Management Plan
UDP	Unitary Development Plan
uFMfSW	updated Flood Map for Surface Water
UKCP09	UK Climate Projections
NW	Northumbrian Water
WCS.....	Water Cycle Study
WFD.....	Water Framework Directive
WIRS.....	Wastewater Incident Register System

1 Introduction

1.1 Commission

Redcar and Cleveland Borough Council (RCBC) commissioned JBA Consulting, in December 2015, to undertake an update of the existing Level 1 Strategic Flood Risk Assessment (SFRA) published in 2010. As a Lead Local Flood Authority (LLFA) and Local Planning Authority (LPA), RCBC require an up-to-date SFRA to develop the evidence base for their new Local Plan and to inform the Sustainability Appraisal (SA).

This SFRA update is required to initiate the sequential risk-based approach to the allocation of land for development and to identify whether the application of the Exception Test is likely to be necessary.

RCBC's new Local Plan will replace the existing development plan documents. The new Local Plan will set out the long term land allocations and other planning policies that will guide development proposals in the borough and will be used to determine planning applications. This SFRA update will help to provide the evidence base in making decisions on where to direct new development to ensure development is located in sustainable locations.

1.2 Redcar and Cleveland Borough Level 1 SFRA Update

This update has been carried out in accordance with the Government's latest development planning guidance including the National Planning Policy Framework³ (NPPF) and flood risk guidance called the Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG). This guidance is regularly updated and is available online via:

<http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>

This updated SFRA makes use of the most up-to-date available flood risk datasets to assess the extent of flood risk, at a strategic level, to potential development allocation sites identified by RCBC.

This SFRA consists of this report together with an appendix containing interactive GeoPDF maps (Appendix A) presenting the potential development sites overlaid with the latest, readily available, gathered flood risk information; and a development site assessment spreadsheet (Appendix B) indicating the level of flood risk to each potential development site following a strategic assessment of risk.

This information will easily allow RCBC to identify the strategic development options that may be applicable to each site and to inform on the application of the Sequential Test. Inferences can then be made as to which sites will require application of the Exception Test as part of a site-specific Flood Risk Assessment (FRA).

A Level 2 SFRA can follow on from the Level 1 assessment to inform on the likelihood of potential development sites passing the Exception Test, based on a more detailed assessment of risk, further to this Level 1 study. The Level 2 study can also be used to assess cumulative impacts of development.

This report begins by outlining the connections between the planning framework and flood risk policy thus discussing current legislation, planning policy, flood risk management policy and the roles and responsibilities of key stakeholders. All sources of flood risk within the local authority area are then examined before a strategic assessment of flood risk to the potential development sites is performed. Conclusions and recommendations for further work are cited at the end of the report.

³ <http://planningguidance.communities.gov.uk/blog/policy/>
2016s3801 RCBC Level 1 SFRA Update Final Report v1.0.docx

The aims and objectives of the SFRA are:

- To form part of the evidence base and to inform the Sustainability Appraisal (Incorporating the Strategic Environmental Assessment) for the council's new Local Plan.
- To make recommendations on the suitability of potential development sites, based on flood risk, for RCBC's new Local Plan.
- To understand flood risk from all sources and to investigate and identify the extent and severity of flood risk throughout the borough. This assessment will enable RCBC to use the sequential approach to development planning by steering development away from those areas where flood risk is considered greatest, ensuring that areas allocated for development can be developed in a safe, cost effective and sustainable manner.
- To enable RCBC to meet its obligations under the National Planning Policy Framework (NPPF).
- To supplement current policy guidelines and to provide a straightforward risk-based approach to development management in the area.
- To provide a reference document (this report) to which all parties involved in development planning and flood risk can reliably turn to for initial advice and guidance.
- To develop a report that forms the basis of an informed development management process that also provides guidance on the potential risk of flooding associated with future planning applications and the basis for site-specific Flood Risk Assessments where necessary.
- To identify open, undeveloped land that should be safeguarded, as set out in the NPPF, for current and future flood management purposes.
- To inform on the implementation of Sustainable Drainage Systems (SuDS) for managing surface water runoff including advice on the application of the council's role in SuDS approval and adoption.
- To provide guidance for developers and planning officers dealing with planning applications as well as for the council to fulfil its role as a Lead Local Flood Authority.
- To assist RCBC in identifying specific locations where further and more detailed flood risk data and assessment work is required as part of a Level 2 SFRA, prior to the allocation of specific development sites.

1.3 SFRA Future Proofing

As discussed, this SFRA has been developed using the most up-to-date data and information available at the time of submission. The SFRA has been future proofed as far as possible though the reader should always confirm with the source organisation (RCBC) that the latest information is being used when decisions concerning development and flood risk are being made. The Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG), alongside the National Planning Policy Framework (NPPF), is referred to throughout this SFRA, being the current primary development and flood risk guidance information available at the time.

The SFRA should be considered as a 'live' document whereby it can be updated as and when more up-to-date information becomes available. The Environment Agency would usually recommend an update to SFRA every three to four years.

2 Study Area

Over 135,200 people live in the Borough of Redcar and Cleveland, according to the 2011 Census. The borough covers approximately 245 km² of land in North Yorkshire and contains such settlements as the towns of Redcar, Marske-by-the-Sea, Guisborough and Saltburn-by-the-Sea and also smaller settlements of Skelton, Loftus and Brotton.

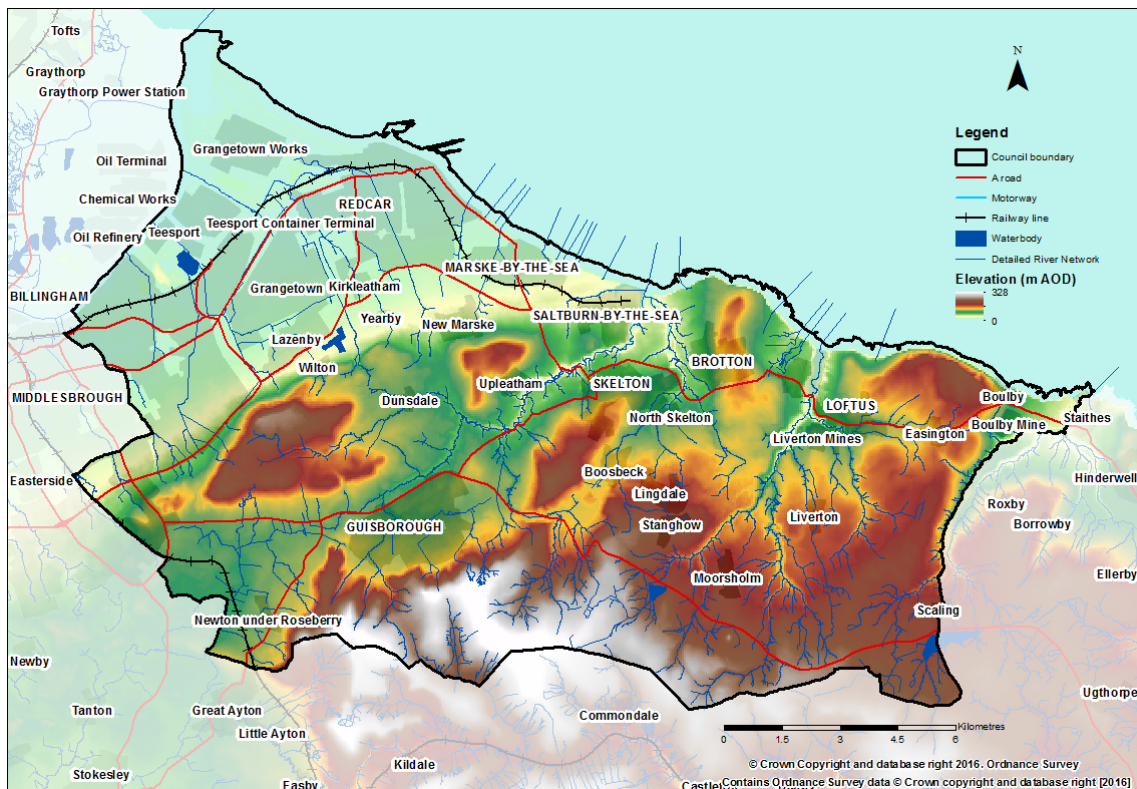
The borough is located on the lower reaches of the River Tees, with the North Sea to the north and the northern region of the North York Moors National Park to the south. The area is typified by old ironstone mining villages and a number of larger coastal settlements such as Redcar itself which is a traditional seaside resort.

Redcar & Cleveland is a district of contrasts, from the heavy industry and associated infrastructure along the lower reaches of the Tees to some of the Country's most dramatic and spectacular coastal and moorland scenery in East Cleveland.

The main source of flood risk is from tidal flooding from the Tees Estuary. Typical of an estuarine coastline, the area has a wide floodplain on low-lying saltmarsh and mudflats. Water levels in the tributaries of the estuary will also be influenced by high tides. In particular, at Redcar, there are problems caused from a combination of wave action and tidal flooding. Fluvial flood risk across the borough is however minimal. The main source of fluvial risk comes from several relatively small watercourses that pass through some towns and villages.

Urban drainage is a key flood concern in the urban north western region of the borough. River tributaries have been intensively urbanised and long reaches of their channels have been straightened, confined, or culverted. Many culverts are considered to be undersized which increases flood risk.

Figure 2-1: Redcar and Cleveland Borough Council SFRA study area



As can be seen by Figure 2-1, the high land of the North York Moors to the south gives way to the flatter estuarine environment of the Tees Estuary in the North West of the borough. The dominant underlying bedrock geology of the borough consists of relatively permeable sandstone,

mudstone and siltstone with the lower and coastal areas also consisting of limestone. There are also drift deposits covering the bedrock of permeable glacial till and sands and gravels.

3 Understanding Flood Risk

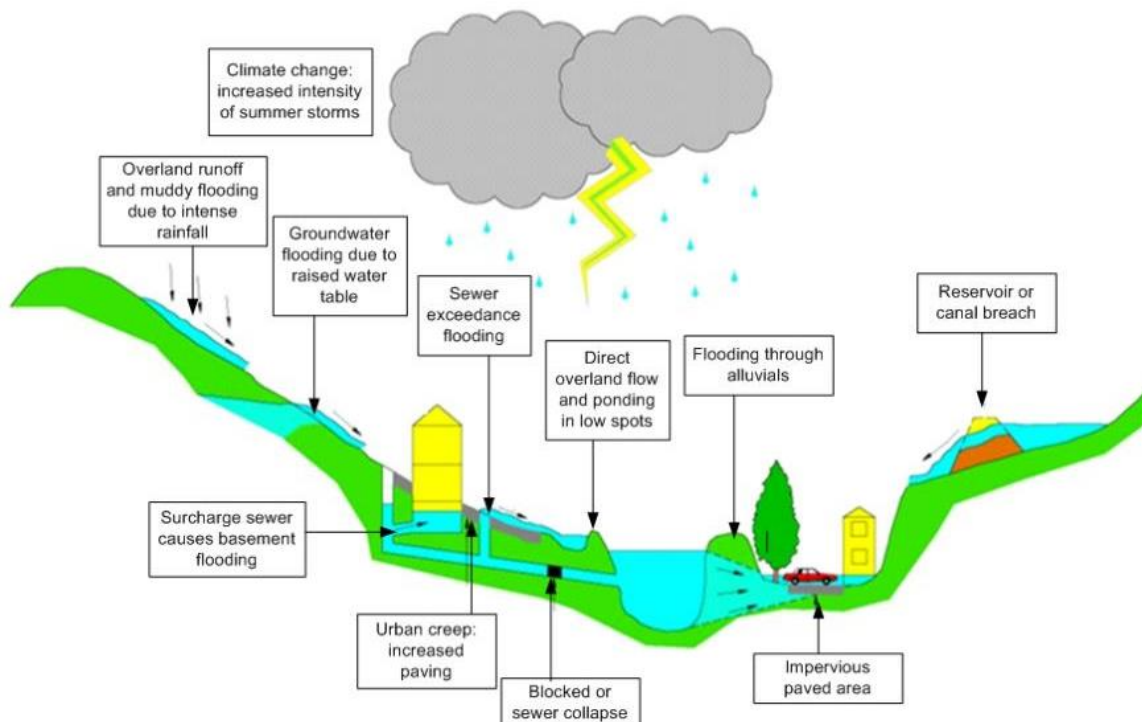
3.1 Sources of Flooding

Flooding is a natural process and can happen at any time in a wide variety of locations. It constitutes a temporary covering of land not normally covered by water and presents a risk when people and human or environmental assets are present in the area that floods. Assets at risk from flooding can include housing, transport and public service infrastructure, commercial and industrial enterprises, agricultural land and environmental and cultural heritage. Flooding can occur from many different and combined sources and in many different ways. Major sources of flooding include (also see Figure 3-1):

- **Fluvial** (rivers) - inundation of floodplains from rivers and watercourses; inundation of areas outside the floodplain due to influence of bridges, embankments and other features that artificially raise water levels; overtopping or breaching of defences; blockages of culverts; blockages of flood channels/corridors.
- **Tidal** - sea; estuary; overtopping of defences; breaching of defences; other flows (e.g. fluvial surface water) that could pond due to tide locking; wave action.
- **Surface water** - surface water flooding covers two main sources including direct run-off from adjacent land (pluvial) and surcharging of piped drainage systems (public sewers, highway drains, etc.)
- **Groundwater** - water table rising after prolonged rainfall to emerge above ground level remote from a watercourse; most likely to occur in low-lying areas underlain by permeable rock (aquifers); groundwater recovery after pumping for mining or industry has ceased.
- **Infrastructure failure** - reservoirs; canals; industrial processes; burst water mains; blocked sewers or failed pumping stations. Considered as residual risk.

Different types and forms of flooding present a range of different risks and the flood hazards of speed of inundation, depth and duration of flooding can vary greatly. With climate change, the frequency, pattern and severity of flooding are expected to change and become more damaging.

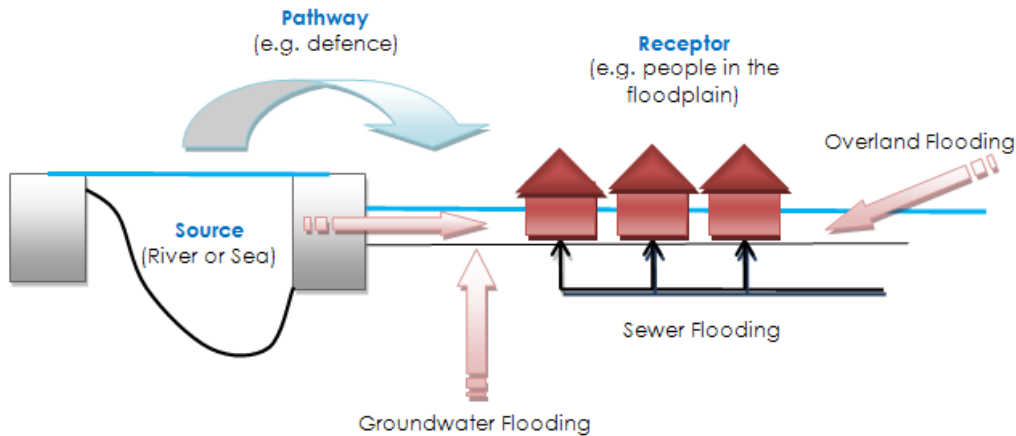
Figure 3-1: Flooding from all sources



3.2 Likelihood and Consequence

Flood risk is a combination of the likelihood of flooding and the potential consequences arising. It is assessed using the source – pathway – receptor model as shown in Figure 3-2 below. This is a standard environmental risk model common to many hazards and should be the starting point of any assessment of flood risk. However, it should be remembered that flooding could occur from many different sources and pathways, and not simply those shown in the illustration below.

Figure 3-2: Source-Pathway-Receptor Model



The principal sources are rainfall or higher than normal sea levels, the most common pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets and the receptors can include people, their property and the environment. All three elements must be present for flood risk to arise. Mitigation measures have little or no effect on sources of flooding but they can block or impede pathways or remove receptors.

The planning process is primarily concerned with the location of receptors, taking appropriate account of potential sources and pathways that might put those receptors at risk. It is therefore important to define the components of flood risk in order to apply this guidance in a consistent manner.

3.2.1 Likelihood

Likelihood of flooding is expressed as the percentage probability based on the average frequency measured or extrapolated from records over a large number of years. A 1% probability indicates the flood level that is expected to be reached on average once in a hundred years, i.e. it has a 1% chance of occurring in any one year, not that it will occur once every hundred years. Table 3-1 provides an example of the flood probabilities used to describe Flood Zones as defined in the Flood Risk and Coastal Change Planning Practice Guidance.

Table 3-1: FRCC-PPG Flood Zones

Flood Zone	Annual Probability of Flooding
1	This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
2	This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
3a	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.
3b	This zone comprises land where water has to flow or be stored in times of flood. This includes land that would flood with an annual probability of 1 in 20 (5%) or 1 in 25 (4%) or greater in any year, or is designed to flood in an extreme (0.1%) flood. Also referred to as functional floodplain.

Considered over the lifetime of a development, such an apparently low frequency or rare flood event has a significant probability of occurring. For example:

- A 1% flood has a 26% (1 in 4) chance of occurring at least once in a 30-year period - the period of a typical residential mortgage;
- And a 49% (1 in 2) chance of occurring in a 70-year period - a typical human lifetime.

3.2.2 Consequence

The consequences of flooding include fatalities, property damage, disruption to lives and businesses, with severe implications for people (e.g. financial loss, emotional distress, health problems). Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow, rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc.). Flood risk is then expressed in terms of the following relationship:

Flood risk = Probability of flooding x Consequences of flooding

3.3 Risk

Flood risk is not static; it cannot be described simply as a fixed water level that will occur if a river overtops its banks or from a high spring tide that coincides with a storm surge. It is therefore important to consider the continuum of risk carefully. Risk varies depending on the severity of the event, the source of the water, the pathways of flooding (such as the condition of flood defences) and the vulnerability of receptors as mentioned above.

3.3.1 Actual Risk

This is the risk 'as is' taking into account any flood defences that are in place for extreme flood events (typically these provide a minimum Standard of Protection (SoP)). Hence, if a settlement lies behind a fluvial flood defence that provides a 1 in 100-year SoP then the actual risk of flooding from the river in a 1 in 100-year event is generally low.

Actual risk describes the primary, or prime, risk from a known and understood source managed to a known SoP. However, it is important to recognise that risk comes from many different sources and that the SoP provided will vary within a river catchment. Hence, the actual risk of flooding from the river may be low to a settlement behind the defence but moderate from surface water, which may pond behind the defence in low spots and is unable to discharge into the river during high water levels.

3.3.2 Residual Risk

Even when flood defences are in place, there is always a likelihood that these could be overtopped in an extreme event or that they could fail or breach. Where there is a consequence to that occurrence, this risk is known as residual risk. Defence failure can lead to rapid inundation of fast flowing and deep floodwaters, with significant consequences to people, property and the local environment behind the defence.

Whilst the actual risk of flooding to a settlement that lies behind a fluvial flood defence that provides a 1 in 100-year SoP may be low, there will always be a residual risk from flooding if these defences overtopped or failed that must be taken into account. Because of this, it is never appropriate to use the term "flood free".

4 The Planning Framework and Flood Risk Policy

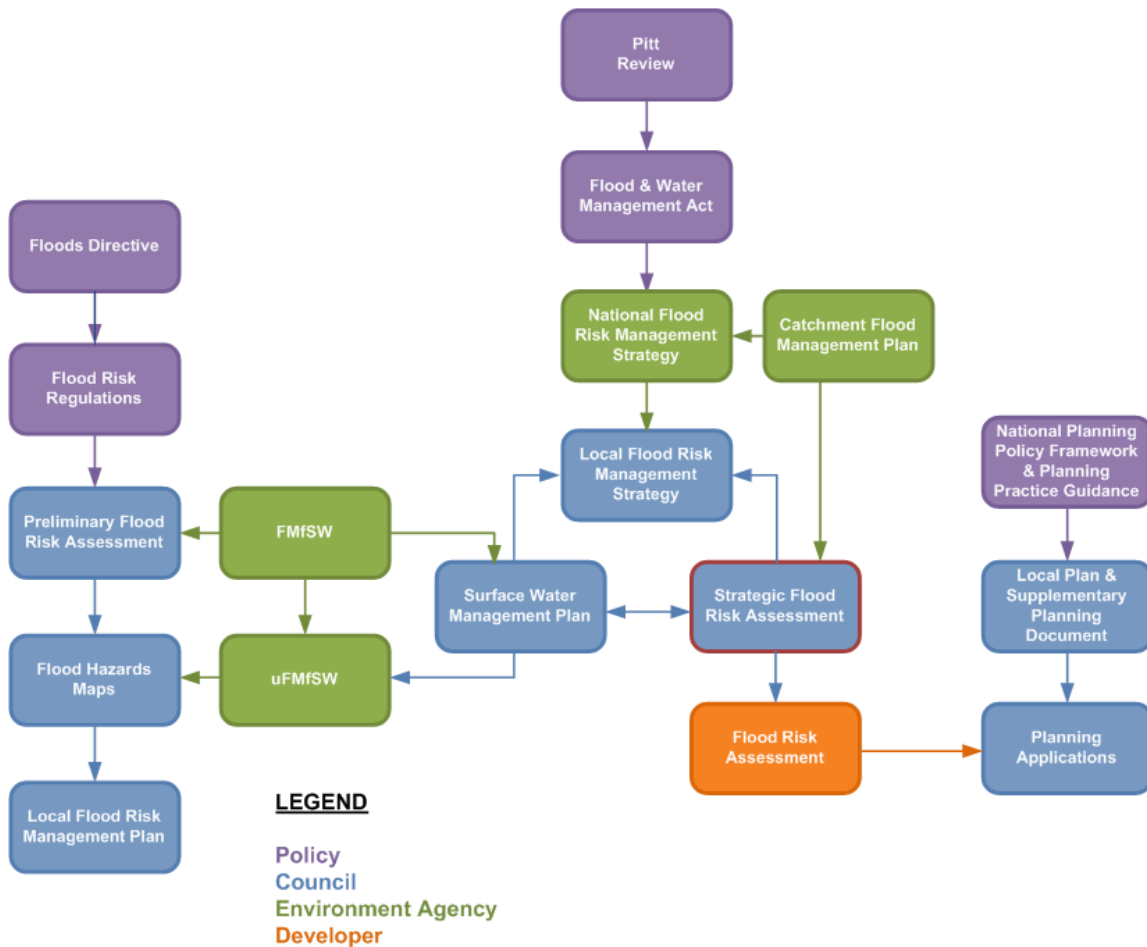
4.1 Introduction

The main purpose of this section of the SFRA is to provide an overview of the key planning and flood risk policy documents that have shaped the current planning framework. This section also provides an overview and context of RCBC's responsibilities and duty in respect to managing local flood risk including but not exclusive to the delivery of the requirements of the Flood Risk Regulations (FRR) 2009 and the Flood and Water Management Act (FWMA) 2010.

Figure 4-1 illustrates the links between legislation, national policy, statutory documents and assessment of flood risk. The figure shows that whilst the key pieces of legislation and policy are separate, they are closely related and their implementation should aim to provide a comprehensive and planned approach to asset record keeping and improving flood risk management within communities.

It is intended that the non-statutory SWMPs and SFRA can provide much of the base data required to support the delivery of the council's statutory flood risk management tasks as well supporting local authorities in developing capacity, effective working arrangements and informing Local Flood Risk Management Strategies (LFRMS) and Local Plans, which in turn help deliver flood risk management infrastructure and sustainable new development at a local level. This SFRA should be used to support RCBC's Local Plan and to help inform on planning decisions.

Figure 4-1: Key documents and strategic planning links with flood risk



4.2 Legislation

4.2.1 EU Floods Directive & the Flood Risk Regulations

The European Floods Directive (2007) sets out the EU's approach to managing flood risk and aims to improve the management of the risk that floods pose to human health, the environment, cultural heritage and economic activity.

The Directive was translated into English law by the Flood Risk Regulations (FRR) 2009 and outlines the requirement for the Environment Agency and Lead Local Flood Authorities (LLFA) to create Preliminary Flood Risk Assessments (PFRAs), with the aim of identifying significant Flood Risk Areas.

The first cycle of PFRAs, completed in 2011, should have covered the entire LLFA area for local flood risk (focusing on ordinary watercourses, surface water and groundwater flooding). If significant Flood Risk Areas were identified using a national approach (and locally reviewed), the LLFA should have then undertaken flood risk hazard mapping and subsequent Flood Risk Management Plans (FRMPs) for these hazard zones, as illustrated in Figure 4-2.

The FRMPs were designed to include measures to reduce the probability of flooding and its potential consequences.

The Environment Agency has implemented one of the exceptions for creating PFRAs, etc. for main rivers and coastal flooding, as they already have mapping (i.e. EA Flood Map for Planning (Rivers and Sea) and Risk of Flooding from Rivers and Sea map (defended)) and plans (i.e. CFMPs, SMPs) in place to deal with this. The Environment Agency has therefore focused its efforts on assisting LLFAs through this process.

These steps are to be reviewed every six years in conjunction with the Water Framework Directive (WFD) cycle. The second cycle of PFRAs should have a specific requirement on climate change and should use the more detailed third generation updated Flood Map for Surface Water (uFMfSW) available from the Environment Agency. The second cycle of PFRAs are due for completion by December 2018.

4.2.1.1 Redcar and Cleveland Borough Preliminary Flood Risk Assessment (2011)

The first cycle PFRA for RCBC was submitted to the Environment Agency in June 2011 and helped to determine whether there was a significant risk in the borough, based on local flooding (surface water, groundwater, ordinary watercourses and canals) and, if so, to identify the parts of the borough affected by these risks.

Based on the evidence that was collected as part of the PFRA process, there were not any past flood events that could be considered to have had 'significant harmful consequences'. However, it was noted that there were a number of locations across Redcar and Cleveland subject to frequent flooding from local sources, particularly from surface water. Based on the Environment Agency's second generation national surface water map (Flood Map for Surface Water) approximately 4,200 properties were estimated to be at risk from flooding to a depth of 0.3 m during a rainfall event with a 0.5% annual exceedance probability (AEP). This did not however meet the Environment Agency threshold of 30,000 people within a cluster of significant areas required to identify a formal Flood Risk Area.

It was concluded that RCBC did not have the evidence (through additional analysis) to justify the identification of any Flood Risk Areas in their administrative area. The absence of a Flood Risk Area meant that the next stage of the PFRA process was not triggered and the council was not

Figure 4-2: EU Floods Directive⁴



⁴ http://ec.europa.eu/environment/water/flood_risk/implem.htm
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required to produce flood hazard maps, flood risk maps and Flood Risk Management Plans. RCBC will still have to produce a Local Flood Risk Management Strategy for its area however, as part of the council's obligations as a LLFA under the Flood and Water Management Act (2010). Whilst this strategy does not have to be done to prescribed deadlines, a strategic approach will be required to assessing and developing solutions to reduce flood risk, using such information as this SFRA. The local strategy should be produced in-line with this SFRA.

4.2.2 Flood & Water Management Act

The Flood and Water Management Act (FWMA) was passed in April 2010. It aims to improve both flood risk management and the way we manage our water resources.

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This includes the creation of a lead role for Local Authorities, as Lead Local Flood Authorities, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the Environment Agency.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by Local Authorities and other key partners. The integration and synergy of strategies and plans at national, regional and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth. Table 4-1 provides an overview of the key LLFA responsibilities under the FWMA.

Table 4-1: Key LLFA Duties under the FWMA

FWMA Responsibility	Description of duties and powers	RCBC LLFA Status
Local Strategy for Flood Risk Management	A LLFA has a duty to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategies will build on information such as national risk assessments and will use consistent risk based approaches across different Local Authority areas and catchments. The local strategy will not be secondary to the national strategy; rather it will have distinct objectives to manage local flood risks important to local communities.	2017
Duty to contribute to sustainable development	The LLFA has a duty to contribute towards the achievement of sustainable development.	Ongoing
Duty to comply with national strategy	The LLFA has a duty to comply with national flood and coastal risk management strategy principles and objectives in respects of its flood risk management functions.	Ongoing
Investigating flood incidents	The LLFA, on becoming aware of a flood in its area, has to the extent it considers necessary and appropriate to investigate and record details of "locally significant" flood events within their area. This duty includes identifying the relevant risk management authorities and their functions and how they intend to exercise those functions in response to a flood. The responding risk management authority must publish the results of its investigation and notify any other relevant risk management authorities.	Ongoing
Asset Register	A LLFA has a duty to maintain a register of structures or features, which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the content of the register and records.	In place
Duty to co-operate and powers to request information	The LLFA must co-operate with other relevant authorities in the exercise of their flood and coastal erosion management functions.	Ongoing
Ordinary Watercourse	A LLFA has a duty to deal with enquiries and determine watercourse consents where the altering, removing or replacing of certain flood risk	Ongoing

FWMA Responsibility	Description of duties and powers	RCBC LLFA Status
Consents	management structures or features that affect flow on ordinary watercourses is required. It also has provisions or powers relating to the enforcement of unconsented works.	
Works Powers	The Act provides a LLFA with powers to undertake works to manage flood risk from surface water runoff, groundwater and ordinary watercourses, consistent with the local flood risk management strategy for the area.	2017
Designation Powers	The Act provides a LLFA with powers to designate structures and features that affect flooding or coastal erosion. The powers are intended to overcome the risk of a person damaging or removing a structure or feature that is on private land and which is relied on for flood or coastal erosion risk management. Once a feature is designated, the owner must seek consent to alter, remove, or replace it.	Ongoing
Emergency Planning	A LLFA is required to play a lead role in emergency planning and recovery after a flood event.	Cleveland Local Resilience Forum - meet 3 times a year
Community involvement	A LLFA should engage local communities in local flood risk management issues. This could include the training of community volunteers, the development of local flood action groups and the preparation of community flood plans, and general awareness raising around roles and responsibilities plans.	Cleveland LRF, Community Risk Register, Community Resilience Project
Planning requirements for SuDS	Sustainable Drainage Systems (SuDS) are to become a planning requirement for major planning applications of 10 or more residential units or equivalent commercial development schemes with sustainable drainage. The LLFA is a statutory planning consultee and it will be between the LPA and the LLFA to determine the acceptability of these proposed sustainable drainage schemes subject to exemptions and thresholds. Approval must be given before the developer can commence construction. Planning authorities should use planning conditions or obligations to make sure that arrangements are in place for ongoing maintenance of any SuDS over the lifetime of the development.	Ongoing
Reservoirs	Designate high risk reservoirs, with preparation of a flood plan by the owner, including all relevant data.	N/A
Latest changes to FWMA legislation ⁵		

4.2.3 Water Framework Directive & Water Environment Regulations

The purpose of the Water Framework Directive (WFD) is to deliver improvements across Europe in the management of water quality and water resources. The Water Environment Regulations (2003) transposed the WFD into law in England and Wales. The first management cycle of the WFD required all inland and coastal waters to reach “good waterbody status” by 2015 through a catchment-based system of River Basin Management Plans (RBMPs), incorporating a programme of measures to improve the status of all natural water bodies. There is an exception for “heavily modified water bodies”, that are required to achieve “good waterbody potential”. The deadline for achieving good waterbody status can be extended to 2021 or 2027 if required, for technical or economic reasons.

The Environment Agency is responsible for monitoring and reporting on the objectives of the Water Framework Directive (WFD) on behalf of government. They work with government, Ofwat, local government, non-governmental organisations (NGOs) and a wide range of other stakeholders including local businesses, water companies, industry and farmers to manage water⁶.

⁵ <http://www.legislation.gov.uk/ukpga/2010/29>

⁶ <https://www.gov.uk/government/policies/water-quality>

The RCBC area is mainly covered by the Northumbria District RBMP but for a small area to the east of Easington, including such settlements as Boulby in the north and Scaling to the south, which are within the Humber District RBMP. Each RBMP was published in December 2009⁷.

The main responsibility for RCBC is to work with the Environment Agency to develop links between river basin management planning and the development of local authority plans, policies and assessments. In particular, the programme of actions (measures) within the RBMPs highlights the need for:

- Water Cycle Studies (WCS) to promote water efficiency in new development through regional strategies and local development frameworks,
- Surface Water Management Plan (SWMP) implementation,
- Considering the WFD objectives (achieving good status or potential as appropriate) in the spatial planning process, and
- Promoting the wide-scale use of Sustainable Drainage Systems (SuDS) in new development.

The Borough of Redcar and Cleveland is included within the Outline Tees Valley Water Cycle Study, December 2012 (see Section 4.4.2), and various Surface Water Management Plans have also been produced by RCBC (see Section 4.4.6).

4.3 Planning Policy

4.3.1 National Planning Policy Framework, 2012

The National Planning Policy Framework (NPPF) was published in March 2012, and is based on core principles of sustainability. It forms the national policy framework in England and is accompanied by a number of Planning Practice Guidance notes.

The NPPF is the national planning policy framework for Local Planning Authorities to help them to prepare Local Plans and take informed development management decisions. Section 10 Paragraph 100 of the NPPF states that Local Plans...

“...should be supported by a Strategic Flood Risk Assessment and develop policies to manage flood risk from all sources, taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as Lead Local Flood Authorities and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to people and property and manage any residual risk, taking account of the impacts of climate change, by applying the Sequential Test, if necessary applying the Exception Test, safeguarding land from development that is required for current and future flood management, using opportunities offered by new development to reduce the causes and impacts of flooding and where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long term, seeking opportunities to facilitate the relocation of development including housing to more sustainable locations”.

The Sequential Test must be performed when considering the placement of future development and for planning application proposals. The Sequential Test is used to direct all new development (through the site allocation process) to locations at the lowest probability of flooding. It states that development should not be permitted or allocated if there are reasonably available sites appropriate for the potential development in areas with a lower probability of flooding.

The Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG) sits alongside the NPPF and sets out detailed guidance on how this policy should be implemented.

⁷ <https://www.gov.uk/government/collections/river-basin-management-plans>
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4.3.2 Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG)

On 6 March 2014 the Department for Communities and Local Government (DCLG) launched their planning practice guidance, including guidance for flood risk and coastal change, which replaces the previous Technical Guidance. This new guidance is available as a web-based resource⁸, which is accessible to all and regularly updated. Whilst the NPPF concentrates on high level national policy, the FRCC-PPG is more detailed. The practice guidance advises on how planning can take account of the risks associated with flooding and coastal change in plan making and the development management process. This is in respect of local plans, SFRAs, the sequential and exception tests, permitted development, site-specific flood risk, Neighbourhood Planning, flood resilience and resistance to make development safe from flooding and vulnerability of development.

4.3.3 Planning and Compulsory Purchase Act, 2004

The Planning and Compulsory Purchase Act (PCPA) sets out provisions in regards to regional functions, local development and development control whilst radically changing the raft of documents required for a Local Plan to be produced and adopted. Previous documents include regional planning guidance, county structure plans, district local plans, unitary development plans, and old-style 'structure' plans. These were replaced with Regional Spatial Strategies (RSS), now abolished, and Local Development Frameworks (LDF) contained within a series of Development Plan Documents (DPD). The LDF has now been replaced by the more concise Local Plan.

4.3.4 Planning Act, 2008

This act predominantly applies to streamlining the approval of major national infrastructure development. However, this act also allowed for the streamlining of planning appeals for minor developments by allowing appeals to be heard and considered by a panel of local councillors rather than by a planning inspector. The Community Infrastructure Levy (CIL) was also formed from the Planning Act, 2008, whereby a local authority could place a levy on a new development to help finance local infrastructure projects designed to benefit the local area, such as a new school, health centre or park improvements.

4.3.5 Localism Act, 2011

The Localism Act was given Royal Assent in November 2011 with the purpose of shifting power from Central Government back to local councils, communities and individuals. The Government abolished Regional Spatial Strategies, providing the opportunity for councils to re-examine the local evidence base and establish their own local development requirements for employment, housing and other land uses through the plan making process.

Additionally, this act places a duty to cooperate on local authorities, including statutory bodies and other groups, in relation to the planning of sustainable development. This duty to cooperate requires local authorities to:

"...engage constructively, actively and on an ongoing basis in any process by means of which development plan documents are prepared so far as relating to a strategic matter." (Provision 110).

This act, together with the Neighbourhood Planning (General) Regulations 2012, also provides new rights to allow Parish or Town Councils to deliver additional development through neighbourhood planning (Neighbourhood Plans). This means local people can help decide where new homes and businesses should go and what they should look like. Local planning authorities will be required to provide technical advice and support as neighbourhoods draw up their proposals. Neighbourhood Plans have a number of conditions and requirements, set out in legislation including the NPPF and FRCC-PPG.

⁸ <http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/>
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4.3.6 Local Plan

A Local Plan⁹ is a statutory document forming the centre of the planning system, designed to promote and deliver sustainable development. Local plans have to set out a clear vision, be kept up-to-date and set out a framework for future development of the local area, addressing needs and opportunities in relation to housing, the economy, community facilities and infrastructure as well as safeguarding the environment and adapting to climate change and securing good design.

Local plans set the context for guiding decisions and development proposals and along with the NPPF, set out a strategic framework for the long-term use of land and buildings, thus providing a framework for local decision making and the reconciliation of competing development and conservation interests. The aim of a Local Plan is to ensure that land use changes proceed coherently, efficiently, and with maximum community benefit. Local plans should indicate clearly how local residents, landowners, and other interested parties might be affected by land use change. They are subject to regular periods of intensive public consultation, public involvement, negotiation and approval.

The NPPF requires that the evidence base for the Local Plan must clearly set out what is intended over the lifetime of the plan, where and when this will occur and how it will be delivered. The NPPF states that local plans should be supported by a SFRA and should take account of advice provided by the Environment Agency and other flood risk management bodies. The SFRA should be used to ensure that when allocating land or determining planning applications, development is located in areas at lowest risk of flooding. Policies to manage, mitigate and design appropriately for flood risk should be written into the Local Plan, informed by both the Sustainability Appraisal and this SFRA.

4.3.6.1 Sustainability Appraisal

The Sustainability Appraisal (SA) is a key component of the Local Plan evidence base, ensuring that sustainability issues are addressed during the preparation of local plans. The SA is a technical document which has to meet the requirements of the Strategic Environmental Assessment Directive 2001/42/EC which assesses and reports on a plan's potential impact on the environment, economy, and society. The SA carries out an assessment of the draft policies at various stages throughout the preparation of the Local Plan, and does this by testing the potential impacts, and consideration of alternatives are tested against the plan's objectives and policies. This ensures that the potential impacts from the plan on the aim of achieving sustainable development are considered, in terms of the impacts, and that adequate mitigation and monitoring mechanisms are implemented.

The Redcar and Cleveland Borough Council Draft Sustainability Appraisal and Strategic Environmental Assessment for the Local Plan were originally completed in October 2013. However, following the withdrawal of the Local Plan at this time, the SA is to be updated in line with the new Local Plan which, at the time of writing, is due for adoption in 2017.

4.3.6.2 Redcar and Cleveland Borough New Local Plan

The Redcar and Cleveland Borough new Local Plan is to be informed by this SFRA and, at the time of writing, is due to be released for consultation in May 2016 with adoption set for 2017. This new Local Plan will replace the existing development plan documents and will set out the long term land allocations and other planning policies that will guide development proposals in the borough and against which planning applications are determined. This SFRA update will help provide the evidence base to make decisions on where to direct new development to ensure development is located in sustainable locations.

Such policy for the new Local Plan, in relation to flood risk and water management, should look to reduce flood risk, promote water efficiency measures, and protect and enhance water quality through mechanisms entailing the following:

- All development must follow the sequential approach to determining the suitability of land for development, directing new development to areas at the lowest risk of flooding and where necessary apply the exception test, as outlined in national planning policy.

⁹ Town and Country Planning, England. The Town and Country Planning (Local Planning) (England) Regulations 2012
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- Developers will be required to demonstrate, where necessary, through an appropriate Flood Risk Assessment (FRA) at the planning application stage, that development proposals will not increase flood risk on site or elsewhere, and should seek to reduce the risk of flooding.
- New development will be required to include or contribute to flood mitigation, compensation and/or protection measures, where necessary, to manage flood risk associated with or caused by the development.
- Development proposals should comply with the Water Framework Directive by contributing to the Northumbria District and Humber District River Basin Management Plans objectives, unless it can be demonstrated that this would not be technically feasible.
- The drainage of new development shall be designed to reduce surface water runoff rates to include the implementation of suitable Sustainable Drainage Systems (SuDS) unless it can be demonstrated that it is not technically feasible or viable.
- Proposals within areas of infrastructure capacity and/or water supply constraint should demonstrate that there is adequate wastewater infrastructure and water supply capacity to serve the development or adequate provision can be made available.

The new Local Plan should be the starting point when considering planning applications.

4.4 Flood Risk Management Policy

4.4.1 Catchment Flood Management Plans

Developed by the Environment Agency, a Catchment Flood Management Plan (CFMP) is a key tool within spatial planning. As well as providing a broad overview of flood risk mainly from Main River and tidal sources, they develop complementary policies for long-term management of flood risk within the catchment that take account of the likely impacts of climate change, the effects of land use and land management whilst helping deliver multiple benefits and contributing towards sustainable development. This is critical when areas under development pressure coincide with high flood risk.

Chosen policies and actions highlight areas where development should be avoided when it is deemed inappropriate to reduce current and future flood risk. They also indicate where water should be allowed to flood or where current flood risk measures should be reduced. Development should therefore be focused towards the more 'sustainable' areas in terms of those locations at lower risk of flooding or where flood risk management is considered viable within the short and long-term plans. Therefore if development has been proposed in flood risk areas and the chosen policy is not to take further action to reduce flood risk, then developments will find it difficult to rely on Environment Agency led FRM infrastructure investment and there will be a great reliance on private (developer) funding to reduce risk. In this instance, development may not be viable.

As part of the CFMP process each CFMP area was divided up into broad areas (known as 'policy units'), which represent areas of similar characteristics, flood mechanisms and flood risks. Each policy unit was then assessed to decide which policy will provide the most appropriate level and direction of flood risk management both now and in the future. Whilst the policy unit simplifies direct action over vast areas of land, in reality, the chosen policy may only focus on a small urban or rural area within that policy unit.

There are two CFMPs which cover the Redcar and Cleveland Borough, namely the Tees CFMP and the Esk CFMP.

4.4.2 Shoreline Management Plans

Shoreline Management Plans (SMPs) cover the whole of the UK coastline and in some cases extend up to the tidal limits of estuaries. In simplistic terms, SMPs cover coastal and tidal flooding while CFMPs cover all other sources of flooding.

SMPs exist to promote prudent management of the coastline. The overall aim of the SMP is to set out a plan for a 100 year period indicating how our coastline should be managed, taking into

account the wider implications on the neighbouring coastline and the environment. It provides a large-scale assessment of the risks associated with coastal processes and presents a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner.

4.4.2.1 River Tyne to Flamborough Head Shoreline Management Plan 2, 2007

The River Tyne to Flamborough Head SMP2 covers an area of coastline extending from the Tyne to Flamborough Head, a distance of approximately 150 km. This coastline between the River Tyne and Flamborough Head was previously divided into three separate SMP's dating from 1997. Due to changing pressures, and the ever-evolving coastline it was necessary to review the SMP's at regular intervals. This section of coast has now been reviewed as one SMP (River Tyne to Flamborough Head SMP2) to enable a broader scale appreciation of the coastal processes to be achieved and to ensure continuous and coherent management policies result.

The River Tyne to Flamborough Head SMP2 is split into policy units (similar to the CFMP policy units). These represent sections of the coastline for which a certain coastal defence management policy has been defined. These are grouped into Management Areas for management purposes. Table 4-2 outlines the Management Areas (MA) covering the Redcar and Cleveland BC area, and the relevant policies chosen for the area. The information contained within Table 4-2 should be considered for future development purposes. The SMP2 policies will have implications on whether a coastal regeneration area will be sustainable in the long-term.

Table 4-2: Relevant SMP2 Policies

Management Area	Policy from Present Day:	Policy Medium - Term	Policy Long - Term	Damages and benefits under the preferred plan
MA13 (Little Scar to Coatham Sands)	Hold the line to Seaton Carew, while allowing natural roll back of the Seaton Sands Dunes and the North Gare Dunes. Allow the natural development of the Bran sands and Coatham Dunes, within the strategic control of maintaining the South Gare.	The same as present day policy but to consider retreat of the Seaton Carew sea front. Detailed consideration of the flood risk to the area to the south and North Gare Breakwater. Land use management plans for the area behind Seaton Dunes.	The same as medium term policy but, ultimately maintain defence to Seaton Carew.	<ul style="list-style-type: none"> • Loss to Gold Course (not included in damages); and • Potential loss to existing sea front at Seaton Carew.
MA14 (Coatham sands to Mill Howe)	Hold the line at Redcar and to the development planned between Redcar and Coatham Sands. Maintain the line of defences to the East of Redcar with possible improved defence of low-lying area behind.	The same as present day policy but realigning the eastern flank of Redcar, while maintaining flood defence to low lying area behind.	The same as medium term policy but, adapt defence to the western end of the Coatham defence to ensure a suitable transition to Coatham Sands.	<ul style="list-style-type: none"> • Potential loss of part of caravan part to west of Redcar; • No increased risk to Redcar; and • Improved resilience to defence of proposed development area.

Management Area	Policy from Present Day:	Policy Medium - Term	Policy Long - Term	Damages and benefits under the preferred plan
MA15 (Mill Howe to Saltburn)	Maintain existing defences at Marske. Hold the line Saltburn.	Review the strategy for defences at Marske with the intention of creating local bastions to maintain the natural headwater. Hold the line at Saltburn. Manage the retreat of the areas between, in particular allow for retreating the car parks.	Hold the Line at Saltburn and allow controlled retreat at Marske.	<ul style="list-style-type: none"> • No anticipated loss of hard assets; and • Retain character and tourism attraction of Saltburn.
MA16 (Saltburn to Huntcliff)	No active intervention in terms of coastal defence. Consideration needs to be given to the threat to the railway.	No active intervention.	No active intervention.	<ul style="list-style-type: none"> • Railway not addressed as a coast protection issue.
MA17 (Huntcliffe and Hummersea Cliff)	Maintain the jetty with rock. This maintains beach levels to Cattersty Sands. Undertake improvement work to Skinningrove structures.	Maintain the jetty and hold the line at Skinningrove with no active intervention elsewhere.	Hold the line at Skinningrove with no active intervention elsewhere.	<ul style="list-style-type: none"> • Loss to the outer section of the Jetty with increased exposure to the village in the long term; and • Maintain the defence to the village.
MA18 (Hummersea Scar to Cowbar)	No active intervention.	No active intervention.	No active intervention.	<ul style="list-style-type: none"> • Potential loss of one property at Boulby Village by 2105.
MA19 (Cowbar to Staithes)	To hold the line in all areas currently defended. Monitor the retreat of adjacent cliffs and relocate the Cowbar lane as necessary	As retreat of the cliff to the east of Cowbar Cottages continues, works may be required to reinforce existing defences. In other areas existing defences would be maintained or replaced, subject to the need being identified by monitoring.	Defence would be maintained beneath Cowbar Cottages and in maintaining the integrity of the north breakwater. Other defences to Staithes would be retained.	<ul style="list-style-type: none"> • Maintain access to the North side of Staithes. • Maintain protection of Cowbar Cottages; and • Maintain defence of the harbour and village.

4.4.3 Water Cycle Studies

The objective of the Tees Valley Water Cycle Study (WCS), December 2012, was to identify any constraints on housing and employment growth planned for the area up to 2026 that may be imposed by the water cycle and how these can be resolved i.e. by ensuring that appropriate water infrastructure is provided to support the proposed development. Furthermore, it will provide a strategic approach to the management and use of water which ensures that the sustainability of the water environment in the region is not compromised.

In terms of flood risk, the WCS states that flood risk in the region is dominated by the North Sea and the River Tees, although there are areas of Flood Zones 2 and 3 associated with smaller watercourses across the area. This assessment will have been based on an older version of the EA's Flood Map for Planning, from at least 2012, though these sources of risk still apply, at the time of writing.

4.4.4 National and Local Flood Risk Management Strategies

As presented in Figure 4-1, the FWMA establishes how flood risk will be managed within the framework of National Strategies for England and Local Strategies for each LLFA area.

The National Strategy for England has been developed by the Environment Agency with the support and guidance of Defra. It sets out principles for how flood risk should be managed and provides strategic information about different types of flood risk and which organisations are responsible for their effective management. The Act requires risk management authorities (local authorities, internal drainage boards, sewerage companies and highways authorities) to work together and act consistently with the National Strategy in carrying out their flood and coastal erosion risk management functions effectively, efficiently and in collaboration with communities, businesses and infrastructure operators to deliver more effective flood risk management.

LLFAs have responsibility for developing a Local Flood Risk Management Strategy (LFRMS) for their area covering local sources of flooding (see Table 4-1). The local strategy produced must be consistent with the National Strategy and this SFRA. The strategy should set out the framework for local flood risk management functions and activities and should raise awareness of local organisations with responsibilities for flood risk management in the area. The strategy should also facilitate partnership arrangements to ensure co-ordination between local organisations and an assessment of flood risk and plans and actions for managing risk, as set out under Section 9 of the FWMA.

The Environment Agency has produced a set of tools to help LLFAs to develop their LFRMS. This toolkit is available from:

<http://learning.environment-agency.gov.uk/capacitybuilding/>

4.4.4.1 Redcar and Cleveland Borough Council Local Flood Risk Management Strategy

RCBC has not, at the time of publication of this SFRA, produced a local strategy for flood risk management. A local strategy action plan was however produced in 2013 which sought to include a strategic investment plan to ensure that funding would be available to support the management of flood and coastal risks.

The action plan noted that the Local FRM Strategy should be the overarching document that will show how RCBC are going to deliver their responsibilities under the FWMA. Without this strategic plan, RCBC will lack direction, may decide on resourcing things that may not be necessary and therefore risk neglecting more important issues. Other risk management authorities must act consistently with the local strategy in respect to FCERM. Without a plan in place, RCBC will struggle to have a voice and influence over local FRM and coastal erosion. It is therefore recommended that RCBC carry out their LFRMS as soon as possible, ensuring consistency with National Strategy and this SFRA.

4.4.5 RCBC Flood Studies

RCBC have commissioned several flood studies including a post flood appraisal¹⁰ in Redcar.

Also in Redcar, a hydraulic modelling study of The Fleet was carried out to investigate flood risk within Redcar. The results of this modelling study highlighted several flow restrictions and areas at flood risk. It was recommended that further investigation is required to alleviate flood prone areas. The developed hydraulic model could be used to test a series of flood alleviation options in the future.

4.4.6 Surface Water Management Plans

In June 2007, widespread extreme flooding was experienced in the UK. The Government review of the 2007 flooding, chaired by Sir Michael Pitt recommended that...

"...Local Surface Water Management Plans (SWMPs) ... coordinated by local authorities, should provide the basis for managing all local flood risk."

The Government's SWMP Technical Guidance document¹¹, 2011, defines a SWMP as:

- *A framework through which key local partners with responsibility for surface water and drainage in their area, work together to understand the causes of surface water flooding and agree the most cost-effective way of managing surface water flood risk.*
- *A tool to facilitate sustainable surface water management decisions that are evidence-based, risk-based, future proofed and inclusive of stakeholder views and preferences.*
- *A plan for the management of urban water quality through the removal of surface water from combined systems and the promotion of SuDS.*

As a demonstration of its commitment to SWMPs as a structured way forward in managing local flood risk, Defra announced an initiative to provide funding for the highest flood risk authorities to produce SWMPs.

RCBC produced a number of SWMPs for the highest surface water risk areas within the borough, based on indicative Critical Drainage Areas (CDAs) delineated within the 2010 Level 2 SFRA. It was recommended that SWMPs be undertaken within these indicative CDAs with a view to investigating the viability of 'green' attenuation schemes and improvements to the sewerage infrastructure to reduce surface water flooding.

It should be noted that these CDAs have not been notified to the LPA by the Environment Agency, as per the NPPF, and as such are not used to define any flood risk policy in the borough. These CDAs were simply a means of identifying the areas at highest risk of surface water flooding where the Council should carry out more detailed investigations through Surface Water Management Plans. The following sections summarise the three SWMPs commissioned by the Council. For more in-depth information on surface water risk, please refer to these SWMPs, each available on RCBC's website.

4.4.6.1 Eston and Guisborough SWMP, 2013¹²

This study revealed a general lack of maintenance of drainage infrastructure across the whole borough. Substantial investment was recommended in watercourse maintenance and improvements to overcome the backlog of neglect. It was also recommended that once the watercourse system was restored to good order it would be necessary to implement a comprehensive inspection and maintenance regime to ensure the system is maintained and kept in good condition.

4.4.6.2 Redcar SWMP, 2014¹³

Part of this study looked at the possibility of upstream flood storage to reduce flooding to areas downstream. It was found that a flood storage scheme at Dormanstown could be feasible

¹⁰ Redcar & Cleveland Borough Council Flooding Review, November 2013

¹¹ Surface Water Management Plan Technical Guidance - <https://www.gov.uk/government/publications/surface-water-management-plan-technical-guidance>

¹² <http://www.redcar-cleveland.gov.uk/rcbcweb.nsf/Web+Full+List/9256A67750BC436480257EF20048D518?OpenDocument>

¹³ <http://www.redcar-cleveland.gov.uk/rcbcweb.nsf/Web+Full+List/085B7FB69809614480257EF2004F5C5D?OpenDocument>

utilising a modest dam (of maximum height 2.5 m) to store a significant volume of water (82,626 m³). A flood storage scheme on Roger Dyke (upstream of the A174) was also examined however this would be at a significant cost (compared to the estimated benefits).

4.4.6.3 Marske, New Marske and Yearby SWMP, 2015¹⁴

This study looked at the feasibility of three separate flood storage schemes located at Gurney Street in the Long Beck catchment, the playing fields above New Marske and at the former NW reservoir located approximately 280 m west of New Marske. The proposed Gurney Street and New Marske playing fields schemes were considered feasible following further evaluation of costs and funding sources. The NW reservoir scheme would require further investigation through hydraulic modelling and structural assessments.

4.4.7 Flood Risk Partnerships and Partnership Plans

RCBC have been involved in the development of the Cleveland Local Resilience Forum (CLRF) which aims to provide collaboration between public agencies, businesses and communities. The CLRF is in place to form a robust and effective multi-agency planning and response framework designed to deliver a coordinated response to a major incident, such as a flood event, affecting the CLRF area. The CLRF is made up of category 1 and category 2 responders.

RCBC have developed a guidance document for communities to develop their own Emergency Plan¹⁵. The document was produced by the Cleveland Emergency Planning Unit¹⁶ and contains a ten step guide to preparing an Emergency Plan that fits the specific needs of a community.

The Cleveland Community Resilience Project focuses on raising awareness of the risks of flooding, responses to flood events and activities that the community can undertake to become more resilient to flooding.

The Tees Valley Strategic Flood Risk Management Partnership is made up of all Tees Valley LLFAs, the Environment Agency and Northumbrian Water. This partnership has been created to enable sharing of information and expertise that is mutually beneficial to all parties.

4.4.8 Redcar and Cleveland Borough Open Space Assessment

In May 2016, RCBC completed an assessment of open space in the borough. Open spaces can generally be categorised into the following types:

- Parks and Gardens;
- Natural and Semi Natural Green Space;
- Amenity Green Space;
- Children's Play Areas;
- Allotments and Community Gardens;
- Cemeteries and Churchyards;
- Outdoor Sports Facilities; and
- Green Corridors.

Open space, sometimes referred to as Green Infrastructure (GI), should be designed and managed as a multifunctional resource capable of delivering a wide range of environmental and quality of life benefits for local communities and should be provided as an integral part of all new development, alongside other infrastructure such as utilities and transport networks.

Open space can provide many social, economic and environmental benefits close to where people live and work including:

- Places for outdoor relaxation and play;
- Space and habitat for wildlife with access to nature for people;

¹⁴ <http://www.redcar-cleveland.gov.uk/rcbcweb.nsf/Web+Full+List/1E12A7B99ABD622D80257EF20055DD2D?OpenDocument>

¹⁵ Developing a Community Emergency Plan, A Guide for Communities at Risk, Cleveland Emergency Planning Unit (<http://www.clevelandemergencyplanning.info/downloads/HC%20CEP%20Brochure%20A5%20v8.pdf>)

¹⁶ <http://www.clevelandemergencyplanning.info/cepu-information-links/about-cepu/>

- Environmental education;
- Local food production - in allotments, gardens and through agriculture;
- Improved health and well-being – lowering stress levels and providing opportunities for exercise; and
- Climate change adaptation - for example flood alleviation and the cooling of urban heat islands.

The NPPF explains that open space can perform many functions, including flood risk mitigation, and that local plans should account for increased flood risk, resulting from climate change, through the planning of Green Infrastructure. GI can have an important role to play in reducing the likelihood of flooding by providing space for flood storage, reducing runoff and increasing infiltration, whilst also providing other benefits as stated above.

Alongside GI should be the implementation of Sustainable Drainage Systems (SuDS), specifically within proposed development sites, where possible. The suitability of GI and SuDS can be informed by this SFRA through the utilisation of open space for water in the areas of greatest flood risk.

The Town and Country Planning Association together with The Wildlife Trusts produced a guidance document for Green Infrastructure¹⁷. The guidance states that local plans should identify funding sources for GI and provision should be made for GI to be adequately funded as part of a development's core infrastructure. For new developments, GI assets can be secured from a landowner's 'land value uplift' and as part of development agreements. The LPA could include capital for the purchase, design, planning and maintenance of GI within its Community Infrastructure Levy (CIL) programme.

There should be an integrated approach to flood risk and open space throughout the borough which would be key in delivering sustainable development. Examples include:

- Restoration of the natural character of floodplains;
- Keeping and preserving of areas of existing natural floodplain;
- Introduction of new areas and enhancing existing areas of greenspace whilst incorporating sustainable drainage within new development; and
- Reduction of downstream flood risk.

4.5 Roles and Responsibilities

The responsibilities for the Risk Management Authorities (RMA) under the Flood and Water Management Act and the Flood Risk Regulations are summarised below.

4.5.1 Environment Agency as a RMA

The Environment Agency:

- Has a strategic overview role for all forms of flooding at the national level;
- Has the power to request information from any partner in connection with its risk management functions;
- Must exercise its flood or coastal erosion risk management functions in a manner consistent with the National Strategy and Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the LLFA; and
- Must help advise on sustainable development.

4.5.2 Redcar and Cleveland Borough Council LLFA as a RMA

RCBC LLFA as a RMA:

¹⁷ Planning for a Healthy Environment - Good Practice Guidance for Green Infrastructure and Biodiversity, Published by the Town and Country Planning Association and The Wildlife Trusts, July 2012

- Must develop, maintain, apply and monitor a strategy for local flood risk management. This must be consulted on with all RMAs, the public and all other partners with an interest in local flood risk, and must comply with the national strategy;
- Is required to coordinate and share information on local flood risk management between relevant authorities and partners;
- Is empowered to request information from others when it is needed in relation to its flood risk management functions;
- Must investigate flooding incidents in its area where it considers it necessary or appropriate;
- Has a duty to establish and maintain a record of structures within its area that have a significant impact on local flood risk;
- Is empowered to designate structures and features that affect flooding;
- Has powers to undertake works to manage flood risk from surface runoff, groundwater and ordinary watercourses;
- Must exercise its flood and coastal erosion risk management functions in a manner consistent with the National Strategy and the Local Strategy;
- Is permitted to agree the transfer of responsibilities for risk management functions (except the production of a Local Strategy) to other RMAs;
- Must aim to contribute to sustainable development;
- Is a statutory consultee on planning applications for major developments with surface water drainage considerations; and
- Should consider flooding issues that require collaboration with neighbouring LLFAs and other RMAs.

4.5.3 Northumbrian Water as a RMA

NW as a RMA:

- Has a duty to act in a manner that is consistent with the National Strategy and have regard to Local Strategies;
- Must be consulted on Local Strategies, if affected by the strategy, by the relevant LLFA;
- Has a duty to be subject to scrutiny from LLFAs;
- Has a duty to cooperate and share information with other RMAs;
- Is responsible for managing the risks of flooding from surface water and foul or combined sewer systems providing drainage from buildings and yards.

4.5.4 Highways Service (RCBC) as a RMA

The Highways Service as a RMA:

- Has a duty to act consistently with the National Strategy and Local Strategies;
- Has responsibility for ensuring effective drainage of local roads in so far as ensuring drains and gullies are maintained;
- Must be consulted on Local Strategies, if affected by the Strategy, by the relevant LLFA; and
- Has a duty to be subject to scrutiny from LLFAs.

4.5.5 The Local Community

The local community:

- Must be consulted on Local Strategies by the LLFA; and
- Have a key role in ensuring local strategies are capable of being successfully delivered within the community. They should actively participate in this process and be engaged by the LLFA.

4.5.6 Riparian Owners

A riparian owner is someone who owns land or property alongside a river or other watercourses including a culvert. A watercourse is any natural or artificial channel through which water flows, such as a river including where rivers flow through a culvert, brook, beck, or mill stream.

Riparian owners have statutory responsibilities, including:

- Maintaining river beds and banks;
- Allowing the flow of water to pass without obstruction;
- Controlling invasive alien species

Further guidance for riverside property owners can be found in the Environment Agency's helpful booklet 'Living on the Edge, 4th Edition'¹⁸ published in June 2013. This guidance is regularly updated.

4.5.7 Developers

- Have a vital role in ensuring effective local flood risk management by avoiding development in areas at risk of flooding. Local Strategies should form a key element of local planning guidance.

¹⁸ <http://www.environment-agency.gov.uk/homeandleisure/floods/31626.aspx>
2016s3801 RCBC Level 1 SFRA Update Final Report v1.0.docx

5 Flood Risk in Redcar and Cleveland Borough

5.1 Flood Risk Datasets

This section of the SFRA provides a strategic overview of flood risk from all sources within the borough. The information contained is the best available at the time of publication and is intended to provide RCBC with an overview of risk. Where further detail is available, then the source of information is provided. Table 5-1 provides a summary of the key datasets used in this SFRA according to the source of flooding.

Table 5-1: Flood source and key datasets

Flood Source	Datasets
Fluvial and tidal	Environment Agency Flood Map for Planning (Rivers and Sea)
	Environment Agency Risk of Flooding from Rivers and the Sea Map
	Tees and Esk CFMPs
	River Tyne to Flamborough Head SMP2
	Environment Agency Flood Risk Mapping Studies
	Historic evidence – Environment Agency Historic Flood Map
	RCBC local flood studies
	RCBC Water Cycle Study
Pluvial (surface water runoff)	Environment Agency updated Flood Map for Surface Water (uFMfSW)
	Indicative Critical Drainage Areas (2010 Level 2 SFRA)
	SWMPs, PFRA
Sewer	Northumbrian Water DG5 Register
	Northumbrian Water Drainage Areas
Groundwater	Environment Agency Areas Susceptible to Groundwater Flooding (AStGWF)
Reservoir	Environment Agency Reservoir Flood Maps (available online)
All sources	2010 Level 1 and Level 2 SFRA
Flood risk management infrastructure	Environment Agency Asset Information System (AIMS)

5.2 Fluvial and Tidal Flooding

Fluvial flooding is associated with the exceedance of channel capacity during higher flows. The process of flooding from watercourses depends on a number of characteristics associated with the catchment including geographical location and variation in rainfall; steepness of the channel and surrounding floodplain; and infiltration and rate of runoff associated with urban and rural catchments.

Judging from the EA Flood Map for Planning (Rivers and Sea), fluvial flood risk in the borough is low. However there are a number of watercourses that flow through the borough. The main watercourses and their tributaries are listed in Table 5-2 and shown on the SFRA Maps in Appendix A.

Table 5-2: Watercourses in Redcar and Cleveland Borough

Major River	Main Tributaries
Skelton Beck	Saltburn Gill; Millholme Beck
	Waterfall Beck; Jocks Row Beck
	Tocketts Beck; Howl Beck
Kilton Beck	Whitecliff Beck; Loftus Beck
	Liverton Beck; Skate Beck
	Hagg Beck; Swindale Beck; Dale Beck
Staithe Beck	Easington Beck; Greenhowe Beck
Main Stell	Several unnamed

The Skelton Beck system, including tributaries, flows towards the coast through mostly rural land though Chapel Beck and Hutton Beck flow through Guisborough causing some risk there. Layland Beck passes through the south east of Skelton though poses minimal risk, whilst Skelton Beck flows through rural land to the north of Skelton and to the east of Saltburn-by-the-Sea. The Kilton Beck system also flows predominantly through rural land though there is some risk within Loftus from Loftus Beck and in Skinningrove from Kilton Beck. The Staithes Beck system flowing along the eastern boundary of the borough poses minimal risk as it flows through rural land and the Main Stell system to the south west also flows through rural land and therefore poses minimal risk to people and property.

Tidal risk mainly comes from the Tees Estuary in the west of the borough though is confined to the Docklands area. There is some risk to industrial buildings at the confluence of Spencer Beck and Normanby Beck. Redcar is at risk from the coast from the Leisure Centre in the west and along Newcomen Terrace, Esplanade, and Granville Terrace over to Zetland Park. There are a number of residential properties at risk in the streets around Park Avenue, to the east of Zetland Park.

The SFRA Maps in Appendix A present the Environment Agency's Flood Map for Planning (Rivers and Sea) which shows the fluvial and tidal coverage of flood zones 2 and 3 across the borough.

5.2.1 Historical Fluvial and Tidal Flooding

RCBC have limited records regarding historical flood incidents. This is not to say such incidents have not occurred, but that they have not been fully recorded. As part of their FWMA duties, RCBC should have a formal register to keep a record of flood incidents in the borough that is continually updated as and when flood events occur. It is recommended that RCBC put in place a system to record incidents of flooding in the borough, including flood sources and properties and infrastructure affected.

The Environment Agency's Historic Flood Map does however indicate past fluvial and tidal flooding in the borough to a variable degree of accuracy.

5.2.1.1 Environment Agency Historic Flood Map

The Historic Flood Map (HFM) contains outlines of past fluvial, tidal and groundwater flooding. These outlines can be viewed on the accompanying SFRA Maps in Appendix A. It does not however contain any information regarding flood source, return period or date of flood.

The HFM indicates nominal areas of previous flooding of the Docklands and of several residential properties from Chapel Beck in Guisborough.

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

The Environment Agency's Flood Map for Planning is the main dataset used by planners for predicting the location and extent of fluvial and tidal flooding. This is supported by the CFMPs and a number of detailed hydraulic river modelling reports which provide further detail on flooding mechanisms.

The Flood Map for Planning provides flood extents for the 1 in 100 AEP fluvial event (Flood Zone 3), the 1 in 200 AEP tidal event (also Flood Zone 3) and the 1 in 1000 AEP fluvial and tidal flood events (Flood Zone 2). Flood zones were originally prepared by the Environment Agency using a methodology based on the national digital terrain model (NextMap), derived river flows from the Flood Estimation Handbook (FEH) and two dimensional flood routing. Since their initial release, the Environment Agency has regularly updated their flood zones with detailed hydraulic model outputs as part of their flood risk mapping programme.

The EA Flood Map for Planning is precautionary in that it does not take account of flood defence infrastructure (which can be breached, overtopped or may not be in existence for the lifetime of the development) and, therefore, represents a worst-case scenario of flooding. The flood zones do not consider sources of flooding other than fluvial and tidal, and do not take account of climate change. For this SFRA, Flood Zone 3 is subdivided into Flood Zone 3a and Flood Zone 3b, which includes areas of functional floodplain (see Section 5.2.3).

The Environment Agency also provides a 'Risk of Flooding from Rivers and the Sea Map'. This map shows the Environment Agency's assessment of the likelihood of flooding from rivers and the sea, at any location, and is based on the presence and effect of all flood defence

infrastructure, predicted flood levels and ground levels. This dataset is further discussed in Section 5.2.4.

This SFRA uses the Flood Map for Planning (Rivers and Sea) version issued in February 2016 to assess fluvial and tidal risk to potential development sites, as per the NPPF and the accompanying Flood Risk and Coastal Change Planning Practice Guidance. See Section 6.4 for this assessment.

5.2.3 Functional Floodplain (Flood Zone 3b)

The NPPF and the Flood Risk and Coastal Change Planning Practice Guidance define functional floodplain as Flood Zone 3b which is described as land where water has to flow or be stored in times of flood and includes water conveyance routes and designated flood storage areas. The FRCC-PPG also states that 'the identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters'.

RCBC agreed the areas defined as functional floodplain in the 2010 SFRA following consultation with the Environment Agency. As part of this SFRA update, the Environment Agency were asked to provide all of its most recent, readily available hydraulic river and coastal model modelled flood outlines for the borough. The Environment Agency however stated that there have not been any hydraulic model updates within the borough since the current functional floodplain outline was developed in the 2010 SFRA, with the exception of the upper reaches of Ormesby Beck.

It has therefore been agreed that for this SFRA update the majority of the 2010 functional floodplain outline is still applicable. The Ormesby Beck area has been updated with the information provided from the 2015 Ormesby Beck Flood Modelling Update.

The functional floodplain is usually defined by more frequent flood events, such as the 1 in 20 or 1 in 25 AEP flood event outlines, but does not include currently developed land (buildings or major transport infrastructure) or areas that are known to benefit from raised flood defences. The functional floodplain should also include areas designed for the storage of flood water i.e. EA designated Flood Storage Areas (FSA). There are no Areas Benefitting from Defences (ABD) or FSAs present within the Redcar and Cleveland authority area.

Flood Zone 3a is defined as the areas of Flood Zone 3 that are not functional floodplain. It is recommended that further analysis is carried out during detailed site-specific FRAs to improve the understanding and assessment of the actual risk and extent of any functional floodplain for those potential development sites that lie within Flood Zone 3a.

5.2.4 Environment Agency Risk of Flooding from Rivers and Sea Map

This map shows the likelihood of flooding from rivers and the sea based on the presence and effect of all flood defences, predicted flood levels and ground levels. The map splits the likelihood of flooding into four risk categories:

- High – greater than to equal to 1 in 30 (3.3%) chance in any given year,
- Medium – less than 1 in 30 (3.3%) but greater than or equal to 1 in 100 (1%) chance in any given year,
- Low – less than 1 in 100 (1%) but greater than or equal to 1 in 1,000 (0.1%) chance in any given year, and
- Very Low – less than 1 in 1,000 (0.1%) chance in any given year.

The Risk of Flooding from Rivers and the Sea Map (RoFRS) is included on the SFRA Maps to act as a supplementary piece of information to assist the LPA in the decision making process for site allocation. The Flood Map for Planning should be used for the sequential testing of site allocations, as per the FRCC-PPG.

5.3 Surface Water Flooding

Surface water flooding, in the context of this SFRA, includes:

- **Surface water runoff (also known as pluvial flooding); and**
- **Sewer flooding**

Judging from the updated Flood Map for Surface Water (uFMfSW), surface water flooding is particularly prevalent over the flatter ground, where surface water can accumulate, particularly to the west of the A174 in Redcar and Eston. Guisborough also appears to be at significant

surface water flood risk. The higher ground to the south and east of the borough appears to be at less risk.

There are certain locations, such as Redcar, Eston and Guisborough mentioned above, where the probability and consequence of pluvial and sewer flooding are more prominent due to the complex hydraulic interactions in the urban environment. Urban watercourse connectivity, sewer capacity, and the location and condition of highway gullies all have a major role to play in surface water flood risk.

It should be acknowledged that once an area is flooded during a large rainfall event, it is often difficult to identify the route, cause and ultimately the source of flooding without undertaking further site-specific and detailed investigations.

5.3.1 Pluvial Flooding

Pluvial flooding of land from surface water runoff is usually caused by intense rainfall that may only last a few hours. In these instances, the volume of water from rural land can exceed infiltration rates in a short amount of time, resulting in the flow of water over the land surface. Within urban areas, this intensity can be too great for the drainage network resulting in excess water flowing along roads, through properties and ponding in natural depressions. Areas at of pluvial flooding can, therefore, lie outside of the fluvial and tidal flood zones.

Pluvial flooding within urban areas throughout the country is typically associated with events greater than the 1 in 30 year design standard of new sewer systems. Northumbrian Water however are required to provide a lower capacity of a 1 in 20 year design standard though flood risk reduction schemes do strive for a 1 in 40 year design standard. There is a residual risk associated with sewer networks due to possible network failures, blockages or collapses.

The updated Flood Map for Surface Water (uFMfSW) is the third generation national surface water flood map, produced by The Environment Agency, aimed at helping to identify areas where localised, flash flooding can cause problems even if the Main Rivers are not overflowing. The uFMfSW, used in this SFRA to assess risk from surface water, has proved extremely useful in supplementing the EA Flood Map for Planning by identifying areas in Flood Zone 1, which may have critical drainage problems. The uFMfSW is a far more accurate representation of surface water risk compared to the first generation Areas Susceptible to Surface Water Flooding (ASStSWF) dataset used in the 2010 Level 1 SFRA.

5.3.2 Environment Agency Updated Flood Map for Surface Water (uFMfSW)

The Environment Agency updated the second generation FMfSW in 2013 to produce the third generation national surface water flood map, the updated Flood Map for Surface Water (uFMfSW). The uFMfSW is much more refined than the second generation map in that:

- More detailed hydrological modelling has been carried out using several design rainfall events rather than one for the second generation,
- A higher resolution Digital Terrain Model (DTM) has been used – 2 m, compared to 5 m for the second generation,
- Manual edits of the DTM to improve flow routes at over 91,000 locations compared to 40,000 for the second generation,
- Manual edits of the DTM to better represent road networks as a possible flow pathways,
- Manning's n roughness (used to represent the resistance of a surface to flood flows in channels and floodplains) values varied using MasterMap Topography layer as opposed to blanket values for urban and rural land use applied in the second generation map.

The National Modelling and Mapping Method Statement, May 2013, details the methodology applied. The uFMfSW is also displayed on the SFRA Maps.

5.3.3 Sewer Flooding

Combined sewers spread extensively across urban areas serving residential homes, businesses and highways, conveying foul and surface water to treatment works. Combined Sewer Overflows (CSOs), provide an EA consented overflow release from the drainage system into local watercourses or large surface water systems during times of high flows. Some areas may also be served by separate foul and surface water sewers which convey waste water to treatment works and surface water into local watercourses.

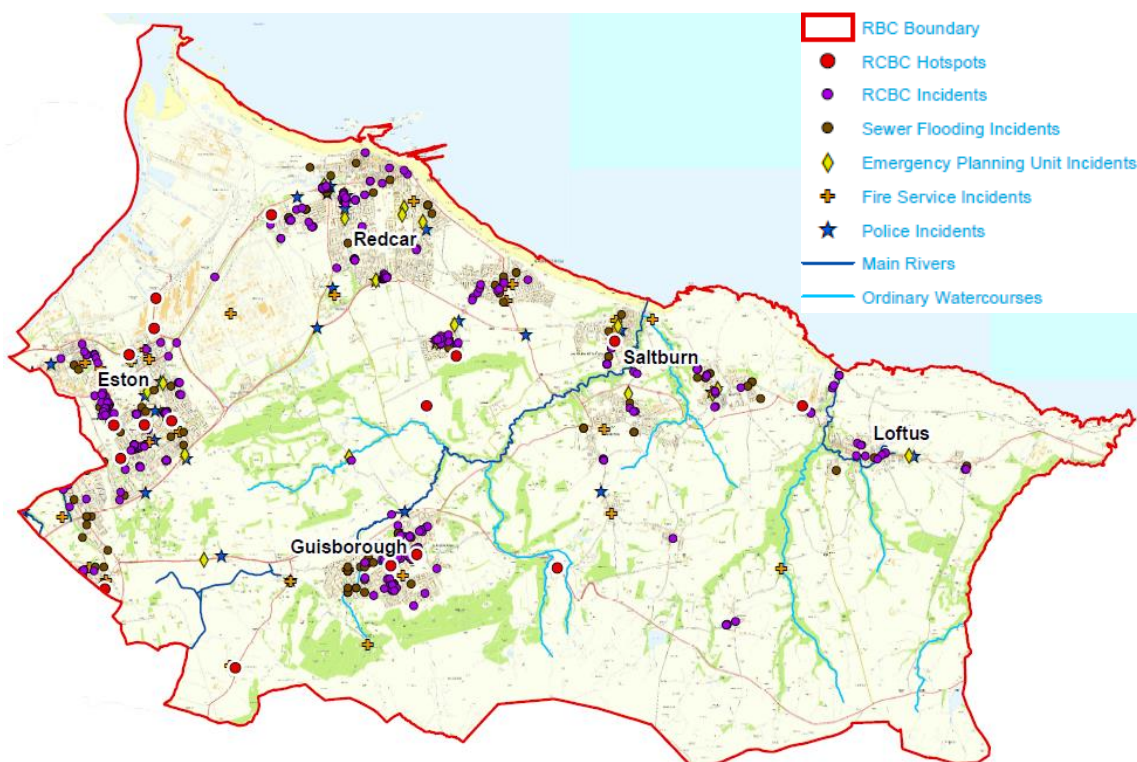
Flooding from the sewer network mainly occurs when flow entering the network, such as an urban storm water drainage system, exceeds its available discharge capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. Pinch points and failures within the drainage network may also restrict flows. The contents of the sewer then begins to back up through the sewers and surcharge through manholes, potentially flooding highways and properties. It must be noted that sewer flooding in 'dry weather' resulting from blockage, collapse or pumping station mechanical failure (for example), is the sole concern of the drainage undertaker.

5.3.4 Historic Surface Water Flooding

Northumbrian Water (NW) provided, within 100 m² areas, their DG5 Register to aid with the understanding of current flood risk flooding. The DG5 Register is used to record flood risk attributable to Water Company controlled sewer networks, whether that be from foul and / or surface water sewers. The DG5 Register is shown on the SFRA Maps.

The RCBC PFRA summarises past surface water flood events in the borough. Recorded surface water flood incidents are shown on Figure 5-1 which is a map extract from the PFRA.

Figure 5-1: Historic surface water flooding incidents (RCBC PFRA 2011)



5.3.5 Locally Agreed Surface Water Information

Environment Agency guidance on using surface water flood risk information recommends that RCBC, as a LLFA, should:

"...review, discuss, agree and record, with the Environment Agency, Water Companies, Internal Drainage Boards and other interested parties, what surface water flood data best represents their local conditions. This will then be known as locally agreed surface water information".

As part of the PFRA, RCBC considered locally agreed surface water information that best represents local conditions to be the Areas Susceptible to Surface Water Flooding map produced by the Environment Agency. As previously mentioned, this was the first of three generations of surface water flood maps produced by the EA. RCBC should now consider the third generation updated Flood Map for Surface Water as their locally agreed surface water flood information, along with the information provided with their SWMPs.

5.4 Groundwater flooding

Groundwater flooding is caused by the emergence of water from beneath the ground, either at point or diffuse locations. The occurrence of groundwater flooding is usually local and unlike

flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability.

There are several mechanisms that increase the risk of groundwater flooding including prolonged rainfall, high in-bank river levels, artificial structures, groundwater rebound and mine water rebound. Properties with basements or cellars or properties that are located within areas deemed to be susceptible to groundwater flooding are at particular risk. Development within areas that are susceptible to groundwater flooding will generally not be suited to SuDS; however, this is dependent on detailed site investigation and risk assessment.

5.4.1 Environment Agency Areas Susceptible to Groundwater Flooding (AStGWF)

The Environment Agency's national dataset, Areas Susceptible to Groundwater Flooding (AStGWF), is the main dataset used to assess the future risk of groundwater flooding. The AStGWF map uses four susceptibility categories to show the proportion of each 1 km grid square where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring. The AStGWF is shown on the SFRA Maps in Appendix A.

5.5 Canal and Reservoir Flood Risk

5.5.1 Canals

There are no canal systems within the borough of Redcar and Cleveland.

5.5.2 Reservoirs

A reservoir can usually be described as an artificial lake where water is stored for various uses. Some reservoirs supply water for household and industrial use, others serve other purposes, for example, as fishing lakes or leisure facilities. The risk of flooding associated with reservoirs is residual and is associated with failure of reservoir outfalls or dam breaching. This risk is reduced through regular maintenance by the operating authority. Reservoirs in the UK have an extremely good safety record with no incidents resulting in the loss of life since 1925.

The Environment Agency is the enforcement authority for the Reservoirs Act 1975 in England and Wales. All large reservoirs must be regularly inspected and supervised by reservoir panel engineers. Local Authorities are responsible for coordinating emergency plans for reservoir flooding and ensuring communities are well prepared. Local Authorities should work with other members of the Cleveland Local Resilience Forum (CLRf) to develop these plans. See Section 6.8.1.1 for information on the Cleveland LRF of which RCBC are a part.

The 2010 Level 1 SFRA stated that the reservoirs within the borough do not receive flow from river catchments and would therefore not be subject to large inflows of water during storm conditions. The risk is therefore perceived to be low and further assessment not required.

5.5.3 Environment Agency Reservoir Flood Maps

The Environment Agency has prepared reservoir flood maps for all large reservoirs that they regulated under the Reservoirs Act 1975 (reservoirs that hold over 25,000 cubic meters of water).

The maps show the largest area that might be flooded if a reservoir were to fail and release the water it holds but do not give any information about the depth or speed of the flood waters. RCBC Emergency Planners should have access to this information so they can develop effective Emergency Plans, if required. Due to the sensitivity of the information, any detailed information on reservoirs is not provided within this SFRA.

However, the reservoir flood maps can be viewed online on the Environment Agency's website¹⁹. The FWMA updated the Reservoirs Act and targeted a reduction in the capacity at which reservoirs should be regulated from 25,000m³ to 10,000m³. This reduction is, at the time of writing, yet to be confirmed meaning the requirements of the Reservoirs Act 1975 should still be adhered to.

¹⁹ http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683.0&y=355134.0&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&to pic=reservoir

5.6 Flood Risk Management

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

5.6.1 Environment Agency Assets

The Environment Agency hold a database called the Asset Information Management System (AIMS) which is a GIS dataset showing the locations of all known flood defence infrastructure across England. AIMS includes such information as asset ownership, maintainer, structure type, condition, age, standard of protection, dimensions, etc. The AIMS dataset was requested from the Environment Agency for inclusion in this SFRA, however it was unavailable at the time of request.

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

- Maintaining and improving the existing flood defences, structures and watercourses.
- Enforcement and maintenance where riparian owners unknowingly carry out work that may be detrimental to flood risk.
- Identifying and promoting new flood alleviation schemes (FAS) where appropriate.
- Working with local authorities to influence the location, layout and design of new and redeveloped property and ensuring that only appropriate development is allowed on the floodplain.
- Operation of Floodline Warnings Direct and warning services for areas within designated Flood Warning Areas (FWA) or Flood Alert Areas (FAA). EA FWAs are shown on the SFRA Maps in Appendix A.
- Promoting awareness of flooding so that organisations, communities and individuals are aware of the risk and are prepared in case they need to take action in time of flood.
- Promoting resilience and resistance measures for those properties already in the floodplain.

5.6.2 Water Company Assets

The sewerage infrastructure of Redcar and Cleveland Borough is likely to be based on Victorian sewers from which there may be a risk of localised flooding associated with the existing drainage capacity and sewer system. The drainage system may be under capacity and / or subject to blockages resulting in localised flooding of roads and property. Northumbrian Water (NW) are responsible for the management of the adopted sewerage system. This includes surface water and foul sewers. There may however be some private surface water sewers in the borough as only those connected to the public sewer network transferred to the water companies under the Private Sewer Transfer in 2011 and others have been constructed since this transfer date. Surface water sewers discharging to watercourses were not part of this transfer and would not therefore be under the ownership of Northumbrian Water, unless adopted under a Section 104 adoption agreement.

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

5.6.3 RCBC Assets

As a LLFA, RCBC own and maintain a number of assets throughout the borough including culverts, bridge structures and trash screens. The majority of these assets are likely to lie along ordinary watercourses, especially within built-up areas, such as Redcar, where watercourses have been culverted or diverted. Other managed assets include highway drains and gullies on major and minor roads. All these assets can offer flood risk management functions as well as having an effect on flood risk if they become blocked or fail.

As part of their FWMA duties, RCBC has a duty to maintain a register of structures or features, which are considered to have a significant effect on flood risk, including details on ownership and condition as a minimum. The Asset Register should outline how RCBC intend to manage these assets or features including their ongoing maintenance programme. Where assets or features are located in a high risk area or have been assessed to have the potential to effect flood risk, RCBC should prioritise and focus any maintenance or upgrades. At the time of writing, RCBC are in the process of updating their asset register, as required under the FWMA.

6 Development and Flood Risk

6.1 Introduction

This section of the SFRA provides a strategic assessment of the suitability of the potential development sites, provided by RCBC, to be considered through the new Local Plan.

The information and guidance provided in this chapter (supported by the SFRA mapping in Appendix A and the Development Site Assessment Spreadsheet in Appendix B) can be used by RCBC to inform their new Local Plan, and provide the basis from which to apply the Sequential Approach in the development allocation and development management process.

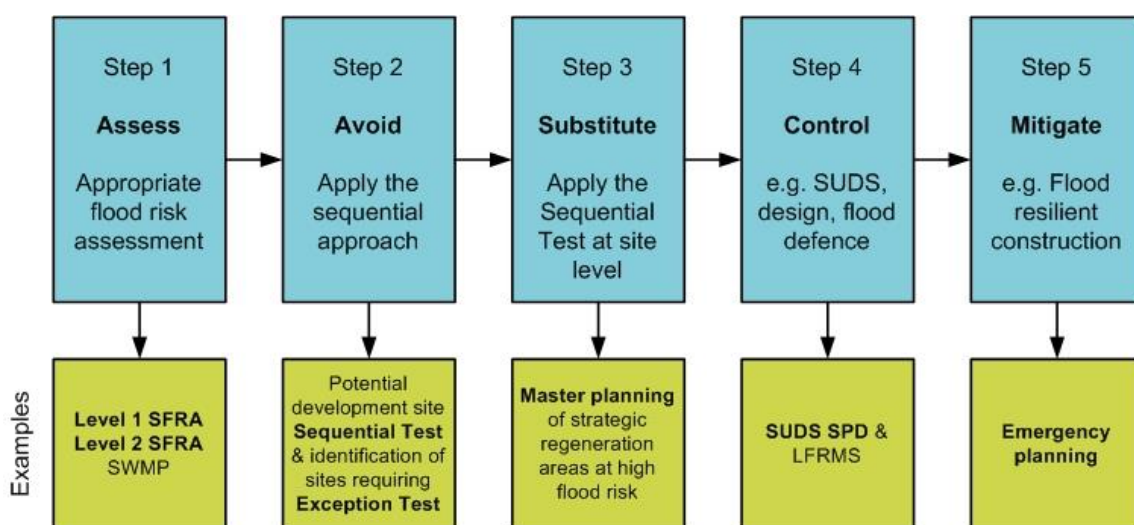
6.2 The Sequential Approach

The Flood Risk and Coastal Change Planning Practice Guidance (FRCC-PPG) provides the basis for the Sequential Approach. It is this approach, integrated into all stages of the development planning process, which provides the opportunities to reduce flood risk to people, their property and the environment to acceptable levels.

The approach is based around the flood risk management hierarchy, in which actions to avoid, substitute, control and mitigate flood risk is central. For example, it is important to assess the level of risk to an appropriate scale during the decision making process, starting with this Level 1 SFRA. Once this evidence has been provided, positive planning decisions can be made and effective flood risk management opportunities identified.

Figure 6-1 illustrates the flood risk management (FRM) hierarchy with an example of how these decisions may translate into the council's management decisions and actions.

Figure 6-1: Flood Risk Management hierarchy



The overall aim of the sequential approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test if required.

There are two different aims in carrying out the Sequential Approach depending on what stage of the planning system is being carried out i.e. Local Planning Authorities (LPAs) allocating land in Local Plans or determining planning applications for development. This SFRA does not remove the need for a site-specific Flood Risk Assessment at the development management stage.

The following sections provide a guided discussion on why and how the Sequential Approach should be applied, including the specific requirements for undertaking Sequential and Exception Testing.

6.3 Local Plan Sequential & Exception Test

RCBC, as the LPA, should seek to avoid inappropriate development in areas at risk of flooding by directing development away from areas at highest risk and ensuring that all development does not increase risk elsewhere and where possible can help reduce risk from flooding to existing communities and development.

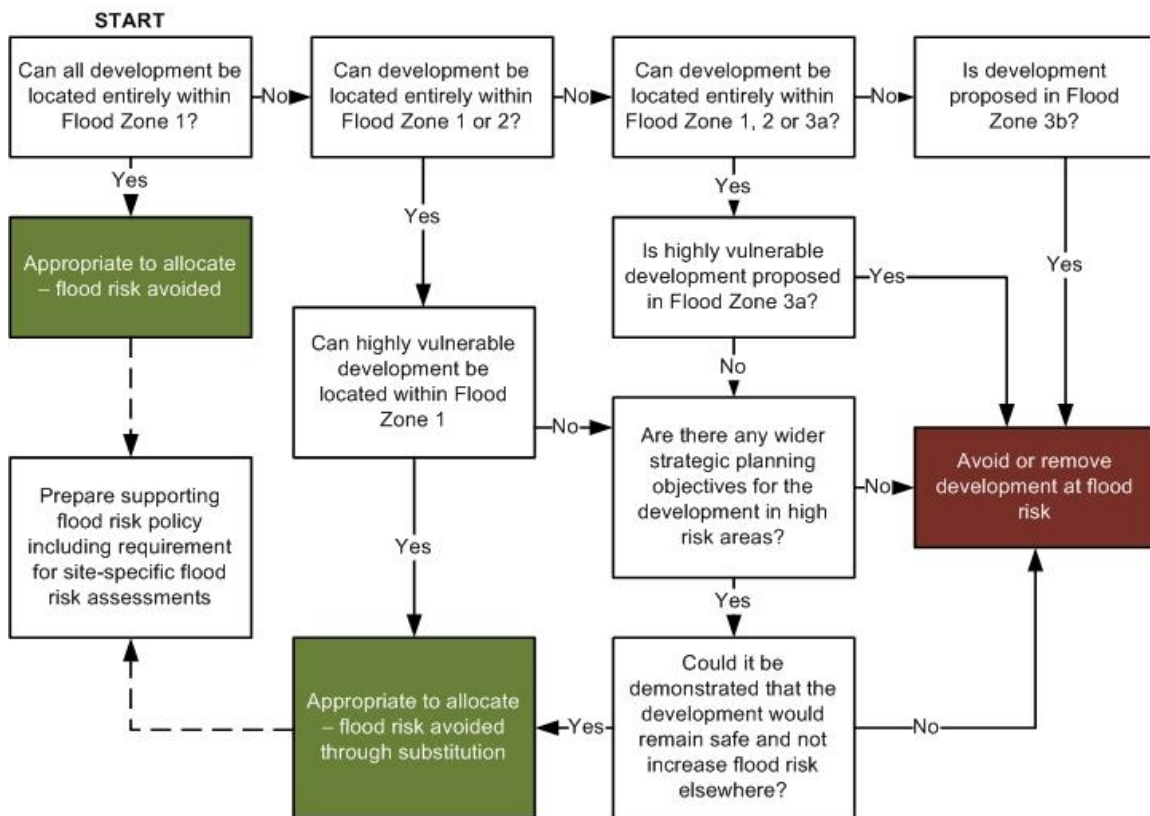
At a strategic level, this should be carried out as part of RCBC's new Local Plan. This should be done by:

1. Applying the Sequential Test and if the Sequential Test is passed, applying the Exception Test, if required;
2. Safeguarding land from development that is required for current and future flood management i.e. land in Flood Zone 3b;
3. Using opportunities offered by new development to reduce the causes and impacts of flooding (i.e. SuDS) and where climate change is expected to increase flood risk so that existing development can be sustainable in the long term; and
4. Seeking opportunities to facilitate the relocation of development including housing to more sustainable locations.

Figure 6-2 illustrates the Sequential and Exception Tests as a process flow diagram using the information contained in this SFRA to assess potential development sites against the Environment Agency's Flood Map for Planning flood zones and development vulnerability compatibilities.

This is a stepwise process, but a challenging one, as a number of the criteria used are qualitative and based on experienced judgement. The process must be documented and the evidence used to support decisions recorded.

Figure 6-2: Local Plan Sequential Approach to Site Allocation



This SFRA provides the main evidence base required to carry out the Sequential Test. The process illustrated in Figure 6-2 also enables those sites that have passed the Sequential Test, and may require the Exception Test, to be identified.

For the Exception Test to be passed, the NPPF Paragraph 102 states:

- a. *It must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk informed by a Strategic Flood Risk Assessment where one has been prepared; and*
- b. *A site-specific Flood Risk Assessment (FRA) must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

Both elements of the test will have to be passed for development to be allocated or permitted.

Although actually passing the Exception Test will require the completion of a site-specific FRA, RCBC should be able to assess the likelihood of passing the test at the Local Plan level by using the information contained in this SFRA to answer the following questions:

- a. Can development within higher risk areas be stopped through avoidance or substitution?
- b. Is flood risk associated with possible development sites considered too high? And will this mean that the criteria for Exception Testing are unachievable?
- c. Can risk be sustainably managed through appropriate development techniques (resilience and resistance) and incorporation of Sustainable Drainage Systems without compromising the viability of the development?
- d. Can the site, and any residual risks to the site, be safely managed to ensure that its occupiers remain safe during times of flood if developed?
- e. Can risk be managed on-site and thus avoid increasing risk off-site to other existing or potential developments?

Where it is unlikely that the Exception Test can be passed due to few wider sustainability benefits, the risk of flooding being too great, or the viability of the site being compromised by the flood risk management work required, then RCBC should consider avoiding the site all together.

Once the process has been completed, RCBC should then be able to allocate appropriate development sites through the new Local Plan, as well as prepare flood risk policy including the requirement to prepare site-specific FRAs for all allocated sites that remain at risk of flooding.

6.4 New Local Plan Potential Development Sites Assessment

This assessment will form part of the evidence base for RCBC's new Local Plan. 295 potential development sites have been assessed and subdivided into several uses including:

- Residential sites from the Strategic Housing Land Area Assessment 2015 (SHLAA) dataset - comprising 102 sites,
- Employment sites, sub-divided into:
 - Employment Land Available: currently undeveloped land reserved for employment uses - comprising 59 sites,
 - Employment Land Developed: currently developed land - comprising 67 sites,
 - Industrial Estates: encompasses all individual employment sites - comprising 30 sites,
- Mixed use - 4 sites including mixed use of housing and employment,
- Traveller - 30 sites allocated for gypsies and travellers.

In order to inform the first part of the Sequential Approach for allocation of development through the new Local Plan (illustrated in Figure 6-2), this SFRA has carried out a high level GIS screening exercise overlaying the potential sites against Flood Zones 1, 2, 3a and 3b.

Surface water risk to the potential sites has also been assessed through the Environment Agency's updated Flood Map for Surface Water dataset to help identify those potential sites that

may have critical drainage problems. The site assessment Excel spreadsheet, included in Appendix B, provides a breakdown of each site and the Area (in hectares) and percentage coverage of each flood zone and each surface water flood zone.

Zones 3b, 3a and 2 are considered in isolation. Any area of a site within the higher risk Flood Zone 3b that is also within Flood Zone 3a is excluded from Flood Zone 3a and any area within Flood Zone 3a is excluded from Flood Zone 2. This allows the sequential assessment of risk at each site by addressing those sites at higher risk first. Table 6-1 provides a count of the number of sites within each Flood Zone.

Table 6-1: Number of potential development sites at risk from Flood Map for Planning flood zones

Potential Development Sites	Number of Sites Within		
	Flood Zone 2	Flood Zone 3a	Flood Zone 3b
Residential	6	6	6
Employment Land Available	5	3	1
Employment Land Developed	9	8	3
Industrial Estate	11	10	3
Traveller	1	1	1
Mixed Use	1	1	1
TOTAL	33	29	15

RCBC should use the Development Site Assessment spreadsheet in Appendix B to identify which sites should be avoided during the Sequential Test. The spreadsheet can also be used to assess whether or not economic and housing projections can be met by purely allocating sites in areas at low risk of flooding

If this is not the case, or where wider strategic objectives require regeneration in areas already at risk of flooding, then RCBC should consider the compatibility of vulnerability classifications and Flood Zones (refer to FRCC-PPG) and whether or not the Exception Test will be required before finalising allocations. The decision making process on site suitability should be transparent and information from this SFRA should be used to justify decisions to allocate land in areas at high risk of flooding.

6.4.1 Sustainability Appraisal and Flood Risk

The Sustainability Appraisal should help to ensure that flood risk is taken into account at all stages of the planning process with a view to directing development away from areas at flood risk, now and in the future, by following the sequential approach to site allocation, as shown in Figure 6-2. Using this SFRA, and specifically the sites assessment information included in Section 6.5 and the Development Site Assessment spreadsheet (Appendix B), the Council should be able to make decisions on the sustainability of specific sites, with regards to flood risk.

By avoiding sites identified in this SFRA as being at significant risk, such as those listed in Section 6.5.1.1, or by considering how changes in site layout can avoid those parts of a site at flood risk, such as any site included within Recommendation C (Section 6.5.1.3), the Council would be demonstrating a sustainable approach to development.

In terms of surface water, the same approach should be followed whereby those sites at highest risk should be avoided or site layout should be tailored to ensure sustainable development. This should involve investigation into appropriate SuDS techniques (see Section 6.7).

Once the Council has decided on a final list of sites following application of the Sequential Test and, where required, the Exception Test following a site-specific FRA, a phased approach to development should be carried out to avoid any cumulative impacts that multiple developments may have on flood risk. For example, for any site where it is required to develop in Flood Zone 3, detailed modelling would be required to ascertain the impact of new development on subsequent water displacement and flow routes, and to calculate subsequent increases in downstream flood volumes. Such modelling should investigate scenarios based on

compensatory storage techniques to ensure that downstream or nearby sites are not adversely affected by development on other sites.

Using a phased approach to development, based on modelling results of floodwater storage options, should ensure that any sites at risk of causing flooding to other sites are developed first in order to ensure flood storage measures are in place before other sites are developed, thus ensuring a sustainable approach to site development. Also, it may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

6.4.2 Safeguarding Land for Flood Storage

As discussed throughout this report, the Council should, where possible, look to allocate land designed for flood storage functions. Such land should be explored through the site allocation process whereby an assessment is made, using this SFRA, of the flood risk at potential sites and what benefit could be gained by leaving the site undeveloped or partially undeveloped. In some instances the storage of flood water can help to alleviate flooding elsewhere, such as downstream developments. Where there is a large area of a site at risk that is considered large enough to hinder development, it may be appropriate to safeguard this land for the storage of water during a flood event.

An assessment has been made of the potential sites and their applicability for flood storage. The Council's Open Spaces Assessment, carried out in 2016, (Section 4.4.8) has also been evaluated for potential flood storage areas. Applicable sites include any current Greenfield sites:

- That are considered to be large enough (>1 ha) to store flood water to achieve effective mitigation,
- That have large areas of their footprint at risk from 1 in 30 or 1 in 100 AEP surface water flood events (based on the uFMfSW),
- That have any part of their area footprint within the functional floodplain (Flood Zone 3b),
- That have large areas of their footprint at risk from Flood Zone 3a, and
- That are large enough and within a suitable distance to receive flood water from a nearby development site using appropriate SuDS techniques which may involve pumping, piping or swales / drains.

Brownfield sites could also be considered though this would entail site clearance of existing buildings and conversion to greenspace. For potential sites where existing use is unknown, an assessment of flood storage applicability has not been carried out.

Potential sites covering existing open 'Greenfield' land that should be safeguarded for flood storage are listed in Table 6-2. Note that parts of the potential development sites included in Table 6-2 may still be available for development, depending on the percentage area at risk. By using the sequential approach to site layout, the LPA and developers should be able to avoid the areas at risk and leave clear for potential flood storage. See the SFRA Maps in Appendix A to view the areas of the potential sites at risk.

Table 6-2: Potential areas to safeguard for flood storage

Reference	Dataset	Location	Area (ha)	Main source of risk	% Area at Risk
073	Open Space Assessment	Armitage Road Playing Field	1.5	Surface water	62 (uFMfSW 30 year)
065	Open Space Assessment	Armitage Road	1.4	Surface water	46 (uFMfSW 30 year)
149	Open Space Assessment	Layland Beck Community Park	3.1	FZ3b, surface water	31 (FZ3b)
118	Open Space Assessment	Marske Valley Gardens	1.0	Surface water	16 (uFMfSW 30 year)
189	Open Space Assessment	Chapel Beck Walkway/Westgate Park	2.8	FZ3b, surface water	14 (FZ3b)
084	Open Space Assessment	Kirkleatham Village Woods	1.6	Surface water	11 (uFMfSW 30 year)

Reference	Dataset	Location	Area (ha)	Main source of risk	% Area at Risk
004	Open Space Assessment	Spencerbeck Field, Ormesby	12	FZ3b	15
ELA43	Employment Land Available	North of Middlesborough Road	2.9	FZ3b	56
ELA13	Employment Land Available	Trunk Road	2.6	Surface water	70 (UFMfSW 100 year)

6.5 Potential development Sites Review

This section of the report assesses flood risk to the potential sites. Section 6.5.1 provides high level broad-brush recommendations for those sites within the fluvial / tidal flood zones of the Flood Map for Planning and functional floodplain. Section 6.5.2 reviews the surface water risk to the potential sites by way of the updated Flood Map for Surface Water.

It is important to consider that each individual site will require further investigation, as local circumstances may dictate the outcome of the recommendation. Such local circumstances may include the following:

- If sites have planning permission but construction has not started, the SFRA will only be able to influence the design of the development e.g. finished floor levels. New, more extensive flood extents (from new models) cannot be used to reject development where planning permission has already been granted,
- Existing planning permissions may exist on some sites where the Environment Agency may have already passed comment and/or agreed to appropriate remedial works concerning flood risk. Previous flood risk investigations or FRAs may already have been carried out at some sites,
- Some sites may be able to develop around the flood risk. Planners are best placed to make this judgement i.e. will the site still be deliverable if part of it needs to be retained to make space for flood water?
- Surrounding infrastructure may influence scope for layout redesign or removal of site footprints from risk,
- Current land use. A number of sites included in the assessment are brownfield (Employment Land Developed) thus the existing development could be taken into account as further development may not lead to increased flood risk. However, the Environment Agency may have their own views on this in regard to health warnings as new-build properties in risk areas could be built with flood protection in mind.

6.5.1 Fluvial and Tidal Risk to Potential Development Sites

The following recommendations provide only a guide, based on the flood risk information made available for this Level 1 SFRA. Information regarding local, site specific information is beyond the scope of this SFRA. It is RCBC's responsibility to carry out sequential testing of each site using the information provided in this SFRA and more specifically using their local, site specific knowledge and advice from the EA. These sections should be read alongside the Development Site Assessment Spreadsheet in Appendix B.

6.5.1.1 Recommendation A – Consider withdrawal of site

This recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

Recommendation A applies to any site within the functional floodplain where the following criteria is true:

- 10% or greater of the site area is within Flood Zone 3b. The FRCC-PPG flood risk vulnerability classification states that only water-compatible uses and essential infrastructure should be permitted in Flood Zone 3b, though any essential infrastructure must pass the Exception Test. Land allocated for housing falls in to the more vulnerable category and sites for employment are in the less vulnerable category. Development should not be permitted for more vulnerable and less vulnerable sites that fall within Flood Zone 3b. Gypsy and traveller sites fall into the highly vulnerable category and are therefore not permitted in Flood Zone 3b or Flood Zone 3a. Mixed use sites should be placed into the higher of the relevant classes of flood risk sensitivity, therefore should be considered more vulnerable. If the developer is able to avoid 3b however, then part of the site could still be delivered.
- The scale of surface water risk on the site is considered large enough that possible mitigation of the risk on site is deemed unlikely to be achievable.

The 10% threshold is not included within any policy, it is merely considered that it is likely to be difficult for developers to deliver a site where 10% or more of the site area is considered as undevelopable. However, this 10% threshold does not account for local circumstances therefore it may be possible to deliver some of the sites included with Recommendation A.

Table 6-3 lists those sites where Recommendation A should apply based on the 10% threshold of site area within the functional floodplain. This accounts for 4 sites. There are a further 5 sites that also fall under Recommendation A based on the level of significant surface water flood risk on-site and the unlikelihood of mitigation based on limited space (see Table 6-7).

For any essential infrastructure developments that are required within Flood Zone 3b, the Exception Test must be applied and passed in order for development to proceed.

Table 6-3: Sites to consider withdrawing that are within Flood Zone 3b

Site ID	Proposed use	Site Area (ha)	% Area within FZ3b
ELA43	Employment Land Available	2.9	56
47a	Residential	4.2	42
114	Industrial Estate	4.3	41
161	Residential	12.1	11

6.5.1.2 Recommendation B – Exception Test

Recommendation B applies to sites where it is likely the Exception Test would be required. This does not include any recommendation on the likelihood of a site passing the Exception Test. These sites would need to be examined as part of a more in-depth Level 2 SFRA. The developer / LPA should attempt to avoid the risk area where possible.

This recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

Recommendation B applies to sites where the following criteria is true:

- 10% or greater of any residential site is within Flood Zone 3a. Only water-compatible and less vulnerable uses of land are appropriate in this zone.
- 10% or greater of any mixed use site that may entail residential use that is within Flood Zone 3a.
- 10% or greater of any traveller site that is within Flood Zone 2.

All development proposals in Flood Zone 3a must be accompanied by a flood risk assessment.

The 10% threshold is not included within any policy, it is merely considered that it would be difficult for developers to avoid Flood Zone 3a when 10% or more of the site area is within it. This 10% threshold does not account for local circumstances therefore it may be possible to avoid Flood Zone 3a altogether for some of the sites included with Recommendation B.

There is only 1 site to which Recommendation B may apply, shown in Table 6-4.

Table 6-4: Site where the Exception Test would be required

Site ID	Proposed use	Site Area (ha)	% Area within FZ3a
386	Residential	1.5	70

6.5.1.3 Recommendation C – Consider site layout and design

Recommendation C recommends a review of site layout and / or design at the development planning stage in order for development to proceed. A Level 2 SFRA or site-specific FRA would be required to inform on site layout and design.

This recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

Recommendation C applies to sites where the following criteria is true:

- <10% of the area of any site type is within Flood Zone 3b.
- <10% of the area of any residential, mixed use entailing residential or traveller site is within Flood Zone 3a.
- <10% of the area of any traveller site that is within Flood Zone 2.

The 10% threshold is not included within any policy, it is merely considered that it may be possible for developers to avoid any flood zone when less than 10% of the site area is at risk. This 10% threshold does not account for local circumstances.

Where Recommendation C applies to a potential site, the developer should consider the site layout with a view to removing the site footprint from the flood zone that is obstructing development or alternatively to attempt the incorporation of on-site storage of water into the site design. Depending on local circumstances, if it is not possible to adjust the site boundary to remove the site footprint to a lower risk zone then this part of the development should **not** be permitted (for any site in Flood Zone 3b or for traveller sites in Flood Zone 3a), or the Exception Test should be undertaken and passed as part of a site-specific FRA (for residential or mixed use sites in Flood Zone 3a or for traveller sites in Flood Zone 2).

Overall there are 12 potential sites to which Recommendation C applies, as listed in Table 6-5.

Table 6-5: Sites where the developer should consider site layout and design

Site ID	Proposed use	Site Area (ha)	Flood Zone
T23	Traveller	1.0	3b
284	Residential	1.9	3b
68	Residential	4.3	3b

Site ID	Proposed use	Site Area (ha)	Flood Zone
ELD10	Employment Land Developed	38.1	3b
I17	Industrial Estate	40.3	3b
ELD37	Employment Land Developed	0.7	3b
423	Residential	0.2	3b
419	Residential	11.0	3b
ELD26	Employment Land Developed	16.9	3b
I15	Industrial Estate	23.3	3b
M3	Mixed Use	73.9	3b
M1	Mixed Use	52.0	3a

Any site layout and design should take account of the 8 m easement buffer along watercourses where development is not permitted. This easement buffer is recommended by the Environment Agency to allow ease of access to watercourses for maintenance works. Any site design, where part of a flood zone is included within the site footprint, should allow water to flow naturally or be stored in times of flood through application of suitable SuDS.

6.5.1.4 Recommendation D – Development permitted subject to FRA

Recommendation D recommends that development could be permitted, assuming a site-specific FRA shows the site can be safe and it is demonstrated that the site is sequentially preferable. A residential or employment site within Flood Zone 2 could still be rejected if the conclusions of the FRA decide development is unsafe or inappropriate.

This recommendation DOES NOT take account of local circumstances, only that part of a site area falls within a Flood Zone.

Recommendation D applies to sites where the following criteria is true:

- Any site within Flood Zone 2 that does not have any part of its footprint within Flood Zone 3a or Flood Zone 3b, with the exception of highly vulnerable developments, such as traveller sites, which would be subject to, and have to pass, the Exception Test.
- Employment sites within Flood Zone 3a. No part of the site can be within Flood Zone 3b.
- Any site 100% within Flood Zone 1 where surface water flood risk is considered to be significant enough so as to require investigation through a site-specific FRA. Surface water risk to sites is assessed in Section 6.5.2.
- Any site where the footprint area is 1 hectare or greater

Recommendation D applies to 181 potential sites.

All development proposals within Flood Zone 2 or Flood Zone 3a must be accompanied by a site-specific Flood Risk Assessment. Any sites 100% within Flood Zone 1 that are 1 hectare or greater in area must be accompanied by a site-specific Flood Risk Assessment to determine vulnerability to flooding from other sources as well as fluvial and tidal. The FRA should determine the potential of increased flood risk elsewhere as a result of the addition of hard surfaces on-site and the effect of new development on surface water runoff.

The FRCC-PPG states:

“Local authorities and developers should seek opportunities to reduce the overall level of flood risk in the area and beyond. This can be achieved, for instance, through the layout and form of development, including green infrastructure and the appropriate application of sustainable drainage systems, through safeguarding land for flood risk management, or where appropriate, through designing off-site works required to protect and support development in ways that benefit the area more generally.” (Paragraph 50).

6.5.1.5 Recommendation E - Permitted subject to consultation with the LPA / LLFA

Recommendation E recommends that developments should be permitted, based on the evidence provided within this SFRA. Further investigation may be required by the developer and the Council should be consulted as to whether a FRA may be required based on any further or new information that may not have been included within this SFRA.

Recommendation E applies to any site that is <1 hectare in size with its area 100% within Flood Zone 1 and with either no known risk or minimal risk from surface water, based on the updated Flood Map for Surface Water.

Recommendation E applies to 97 sites which equates to 33% of the 295 sites assessed.

6.5.2 Surface Water Risk to Potential Development Sites

This section assesses surface water risk to each site according to the uFMfSW. The Development Site Assessment spreadsheet in Appendix B isolates each of the surface water outlines so that any area of a site within the higher risk 1 in 30 year outline is excluded from the medium risk 1 in 100 year outline and any area within the 1 in 100 year outline is excluded from the lower risk 1 in 1000 year outline. This allows a sequential assessment of risk at each site. Table 6-6 shows the number of sites at risk for each event. A number of these sites are also at fluvial and / or tidal flood risk.

NOTE: This assessment of surface water risk to sites DOES NOT take account of local circumstances, only that part of a site area falls within a surface water flood outline of the updated Flood Map for Surface Water.

Table 6-6: Number of sites at risk from surface water flooding

uFMfSW event	Number of sites at risk	Number of sites with =>10% / =>20% area at risk
1 in 30 year	149	9
1 in 100 year	192	11
1 in 1000 year	248	25^
*In reality, sites within the 1 in 30 year outline will also be in the 1 in 100 year outline and those within the 1 in 100 year outline will also be in the 1000 year outline.		
^Based on 20% percentage threshold		

Table 6-6 summarises the number of sites at risk from each surface water flood zone. Of the 149 sites at risk from the higher risk 1 in 30 year event, 6% have over 10% of their site area at risk. The same can be said with the medium risk 1 in 100 year event with only 6% of sites having greater than 10% of their area at risk. For the lower risk 1 in 1000 year extreme event, 10% of sites have over 20% of their area at risk.

As explained with the fluvial / tidal flood zones assessment, the percentage thresholds are not included within any policy, it is merely considered that where a site has 10% or greater of its area at risk from the 1 in 30 and 1 in 100 year event outlines, or 20% or greater for the 1 in 1000 year event, then it could prove difficult to manage this surface water on-site. A site-specific FRA should therefore be carried out to investigate possible mitigation measures for flood storage or infiltration techniques through appropriate SuDS. The percentage thresholds do not consider local conditions.

Table 6-7: Sites to consider withdrawing based on surface water risk

Site ID	Proposed use	Site Area (ha)	% Area within 1 in 30 Year Outline (uFMfSW)
M2	Mixed Use	8.66	35
36	Residential	0.37	23
395	Residential	1.06	18
119	Residential	4.46	18
347	Residential	1.30	12

The Employment Land Developed (ELD) sites ELD38, ELD9 and ELD48 are at high risk from surface water flooding (see Appendix B). However, as these sites are already developed, withdrawal is not appropriate. However, as part of a detailed FRA, current drainage systems should be assessed for each site and where possible, space created on-site for suitable SuDS.

For all sites at surface water flood risk the following should be considered:

- A review of the Surface Water Management Plan, if applicable to the site. The SWMP should include more detailed modelled outputs and recommendations beyond the scope of this SFRA;
- Possible withdrawal (see Table 6-7), redesign or relocation of the site, certainly for those sites at higher risk from the 1 in 30 year event and those with a large percentage area at risk. These sites are considered to be too small to be able to mitigate the level of surface water risk apparent at each site;
- A detailed site-specific Flood Risk Assessment incorporating surface water flood risk management;
- Any FRA may want to consider detailed surface water modelling using current SWMP models if applicable, particularly for the larger sites which may influence sites elsewhere;
- The size of development and the possibility of increased surface water flood risk caused by development on current Greenfield land, and cumulative impacts of this within specific areas;
- Management and re-use of surface water on-site, assuming the site is large enough to facilitate this and achieve effective mitigation;
- Larger sites should look to leave surface water flood prone areas as open greenspace, incorporating social and environmental benefits;
- Effective surface water management should ensure risks on and off site are controlled; and
- SuDS should be used where possible. Appropriate SuDS may offer opportunities to control runoff to Greenfield rates. Restrictions on surface water runoff from new development should be incorporated into the development planning stage. For brownfield sites, where current infrastructure may be staying in place, then runoff may look to be controlled to current rates or, where possible, reduced.

6.5.3 Development Management Sequential & Exception Test

This section of the SFRA has been developed to provide a useful tool to inform the development management process about the potential risk of flooding associated with future planning applications and the basis for requiring site-specific FRAs where necessary.

According to the NPPF Paragraph 103:

“When determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment following the Sequential Test, and if required the Exception Test, it can be demonstrated that:

- *Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location; and*
- *Development is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed, including by emergency planning; and it gives priority to the use of sustainable drainage systems.”*

Paragraph 011 of the NPPF re-affirms planning law that applications for planning permission...

“...must be determined in accordance with the development plan unless material considerations indicate otherwise”.

Development proposals that are in line with Local Plan policies should be approved. Those that conflict should be refused unless material considerations indicate otherwise.

6.5.4 Demonstrating the Sequential Test for Planning Applications

The Environment Agency recommends the following staged approach is used by LPAs to apply the Sequential Test to planning applications located in flood zones 2 or 3. Figure 6-3 illustrates

the staged approach. The approach provides an open demonstration of the Sequential Test being applied in line with the NPPF and the FRCC-PPG. Close working between LPA Development Management and Spatial Planning departments will be required to implement the Sequential Test effectively. The Environment Agency also works with local authorities to agree locally specific approaches to the application of the Sequential Test and any local information or consultations with the Lead Local Flood Authority should be taken into account.

Stage 1 – Strategic application & development vulnerability

The Sequential Test does not apply to change of use applications unless it is for change of land use to a caravan, camping or chalet site, or to a mobile home site or park home site. The Sequential Test can also be considered adequately demonstrated if both of the following criteria are met:

- The Sequential Test has already been carried out for the site (for the same development type) at the strategic level (Local Plan); and
- The development vulnerability is appropriate to the Flood Zone (see Table 3 of the FRCC-PPG).

If both these criteria are met, reference should be provided for the site allocation of the Local Plan document and the vulnerability of the development should be clearly stated. There would be no need to carry out stages 2 and 3. If neither criterion is met, then the applicant should move onto Stage 2.

Stage 2 – Defining the evidence base

Stage 2 considers the parameters in which the Sequential Test is to be applied, including:

- The geographic area in which the test is to be applied;
- The source of reasonable available sites in which the application site will be tested against; and
- The evidence and method used to compare flood risk between sites.

Stage 3 – Applying the Sequential Test

Stage 3 focuses on applying the Sequential Test by comparing the reasonably available sites identified under Stage 2 with the application site.

Sites should be compared in relation to flood risk; Local Plan status; capacity; and constraints to delivery including availability, policy restrictions, physical problems or limitations, potential impacts of the development, and future environmental conditions that would be experienced by the inhabitants of the development.

The test should conclude if there are any reasonably available sites, in areas with a lower probability of flooding that would be appropriate to the type of development or land use proposed.

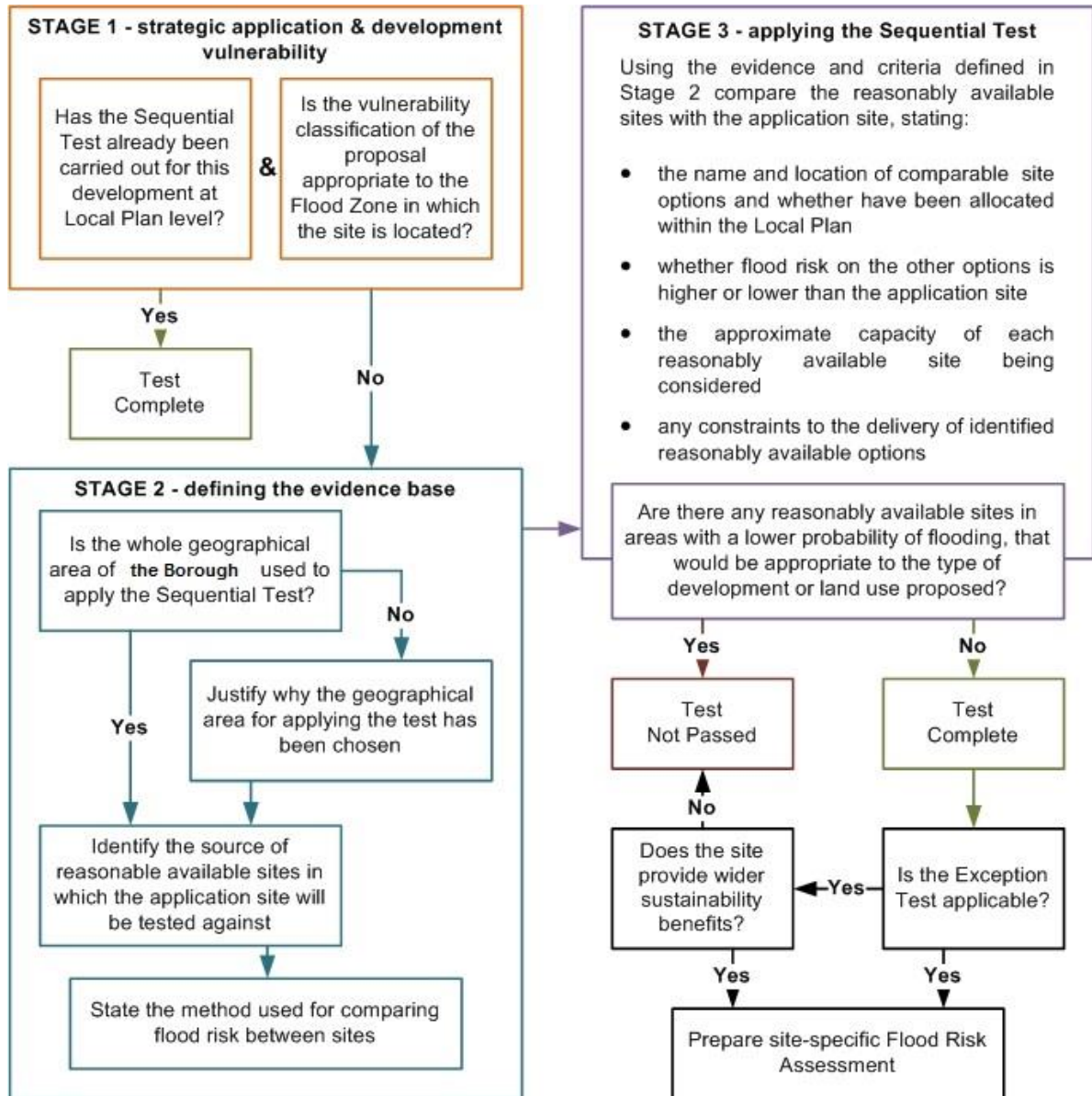
From the information provided in these three stages, the LPA should be able to assess whether or not the potential site has passed the Sequential Test. If the Test has been passed then the applicant should apply the Exception Test in the circumstances set out by tables 1 and 3 of the FRCC-PPG.

In all circumstances, where the site is within areas at risk of flooding and where a site-specific FRA has not already been carried out, a site-specific FRA should be completed in line with the NPPF and the FRCC-PPG. Further guidance is provided in Section 6.6.

In addition to the formal Sequential Test, the NPPF sets out the requirement for developers to apply the sequential approach to locating development and considering the site layout within the site. As part of their application and masterplanning discussions with applicants, LPAs should seek whether or not:

- Flood risk can be avoided by substituting less vulnerable uses or by amending the site layout;
- Less vulnerable uses for the site have been considered; or
- Density can be varied to reduce the number or the vulnerability of units located in higher risk parts of the site.

Figure 6-3: Development management sequential test process



6.6 Guidance for Developers

This SFRA provides the evidence base for developers to assess flood risk at a strategic level and to determine the requirements of an appropriate site-specific FRA. The aim of this section is to provide guidance for developers on using this SFRA.

When initially considering the development options for a site, developers should use this SFRA, the NPPF and the Planning Practice Guidance to:

- **Check whether the site is**
 - *A windfall development, allocated development, within a regeneration area, single property or subject to a change of use to identify if the Sequential and Exception Tests are required.*
- **Check whether the Sequential Test and / or the Exception Test have already been applied**
 - *Request information from the LPA on whether the Sequential Test, or the likelihood of the site passing the Exception Test, have been assessed;*
 - *If not, provide evidence to the LPA that the site passes the Sequential Test and will pass the Exception Test.*
- **Consult with the LPA Development Control, the LLFA and the Environment Agency and the wider group of flood risk consultees, where appropriate, to scope an appropriate FRA if required**
 - *Guidance on FRAs provided in Section 6.6.1 of this SFRA;*
 - *Also refer to the Environment Agency Standing Advice, CIRIA Report C624, the NPPF and the Planning Practice Guidance;*
- **Submit FRA to Development Control and the Environment Agency for approval, where necessary**

Table 6-8 identifies, for developers, when the Sequential and Exception Tests are required for certain types of development and who is responsible for providing the evidence and those who should apply the tests if required.

Table 6-8: Development types and application of Sequential and Exception Tests for developers

Development	Sequential Test Required	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
Allocated Sites	No	LPA should have already carried out the test during the allocation of development sites	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed, possibly through a Level 2 SFRA. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Windfall Sites	Yes	Developer provides evidence, to the LPA that the test can be	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

Development	Sequential Test Required	Who Applies the Sequential Test?	Exception Test Required?	Who Applies the Exception Test?
		passed. An area of search should be agreed within local community boundary		
Regeneration Sites Identified Within Local Plan	No	-	Dependent on land use vulnerability	LPA to advise on the likelihood of test being passed. The developer must also provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Redevelopment of Existing Single Properties	No	-	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA
Changes of Use	Yes for minor development such as caravan / camping, chalet sites	Developer provides evidence to the LPA that the test can be passed	Dependent on land use vulnerability	Developer must provide evidence that the test can be passed by providing planning justification and producing a detailed FRA

6.6.1 Site-Specific Flood Risk Assessment

According to the FRCC-PPG (Para 030), a site-specific FRA is:

“...carried out by (or on behalf of) a developer to assess the flood risk to and from a development site. Where necessary (see footnote 20 in the National Planning Policy Framework), the assessment should accompany a planning application submitted to the local planning authority. The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development’s lifetime, taking climate change into account, and with regard to the vulnerability of its users (see Table 2 – Flood Risk Vulnerability of PPG).”

The objectives of a site-specific FRA are to establish:

1. Whether a potential development is likely to be affected by current or future flooding (including effects of climate change using EA climate change allowances, February 2016) from any source. This should include referencing this SFRA to establish sources of flooding. Further analysis should be performed to improve understanding of flood risk including agreement with the Council on areas of functional floodplain that have not been specified within this SFRA;
2. Whether the development will increase flood risk elsewhere;
3. Whether the measures proposed to deal with these effects and risks are appropriate;
4. The evidence for the local planning authority to apply (if necessary) the Sequential Test; and
5. Whether the development will be safe and pass the Exception Test, if applicable.

The FRCC-PPG doesn't contain any further detail on the minimum requirements for site-specific FRAs. It is therefore important that the Environment Agency's FRA guidance²⁰ is referred to and also the site-specific Flood Risk Assessment Checklist in paragraph 068 of the FRCC-PPG should be consulted. CIRIA's report 'C624 Development and Flood Risk' also provides useful guidance.

When is a Site-Specific FRA Required?

According to NPPF footnote 20, a site-specific FRA should be prepared when the application site is:

- Situated in Flood Zone 2 and 3; for all proposals for new development (including minor development and change of use)
- 1 hectare or greater in size and located in Flood Zone 1
- Located in Flood Zone 1 where there are critical drainage problems
- At risk of flooding from other sources of flooding, such as those identified in this SFRA
- Subject to a change of use to a higher vulnerability classification which may be subject to other sources of flooding

The LPA may also like to consider further options for stipulating FRA requirements, such as:

- Situated in an area currently benefitting from defences (therefore residual risk)
- Situated within 20 metres of the bank top of a Main River
- Situated over a culverted watercourse or where development will require controlling the flow of any river or stream; or where the development could potentially change structures known to influence flood flow

These further options should be considered during the preparation and development of the new Local Plan

6.6.2 Taking Climate Change into Account

Climate change will increase flood risk over the lifetime of a development. In making an assessment of the impacts of climate change on flooding from the land and rivers as part of a FRA, the sensitivity ranges shown below may provide an appropriate precautionary response to the uncertainty about climate change impacts on rainfall intensities and river flow.

Considering the impacts of climate change within a FRA will have implications for both the type of development that is appropriate, according to its vulnerability to flooding, and the design standards for any SuDS or mitigation schemes proposed. For example through very flat floodplains, using the +25 per cent from 2070 to 2115 allowance for peak river flows, could see an area currently within lower risk zones (Flood Zone 2), in future be re-classified as lying within a higher risk zone (Flood Zone 3a). Therefore residential development may not be appropriate without suitable flood mitigation measures or flood resilient or resistant houses. In well-defined floodplains the same climate change allowance could have significant impacts on flood depths influencing building type and design (e.g. finished floor levels).

The Environment Agency revised the climate change allowances, in February 2016, for use in FRAs and SFRAs and will use these revised allowances when providing advice:

<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

The revised climate change allowances are predictions of anticipated change for:

- Peak river flow by River Basin District;
- Peak rainfall intensity;
- Sea level rise; and
- Offshore wind speed and extreme wave height.

Deciding on which of the peak river flow allowances to use is based on the flood zone the development is within and the associated vulnerability classification (see Table 2 of the FRCC-PPG). Table 6-9 and Table 6-10 show the peak river flow allowances for the Northumbria and Humber River Basin Districts respectively.

Table 6-9: Recommended Peak River Flow Allowances for the Northumbria River Basin District

Allowance Category	Total Potential Change Anticipated for...		
	2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
Upper end	+20%	+30%	+50%
Higher central	+15%	+20%	+25%
Central	+10%	+15%	+20%

Table 6-10: Recommended Peak River Flow Allowances for the Humber River Basin District

Allowance Category	Total Potential Change Anticipated for...		
	2020s (2015-2039)	2050s (2040-2069)	2080s (2070-2115)
Upper end	+20%	+30%	+50%
Higher central	+15%	+20%	+30%
Central	+10%	+15%	+20%

The peak rainfall intensity allowance applies to the whole of England. SFRA and FRA should assess both the central and upper end allowances to gauge the range of impacts. Table 6-11 shows these allowances.

Table 6-11: Peak Rainfall Intensity Allowance in Small and Urban Catchments for England

Allowance Category	Total Potential Change Anticipated for...		
	2010-2039	2040-2059	2060-2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

Allowances for sea level rise are based on different regions of England. The allowances for the North East of England are shown in Table 6-12. The number in brackets is the cumulative sea level rise for each year within each range.

Table 6-12: Sea Level Allowance for North East England

1990 - 2025	2026 - 2050	2051 - 2080	2081 - 2115	Cumulative Rise 1990 - 2115
2.5 mm (87.5 mm)	7 mm (175 mm)	10 mm (300 mm)	13 mm (455 mm)	1.02 m

The Environment Agency will also require consideration, if appropriate, of the 'high++ allowances' for peak river flows and mean sea level rise where a development is considered to be very sensitive to flood risk and with lifetimes beyond the end of the century. This could include infrastructure projects or developments that significantly change existing settlement patterns. The high++ allowances can be found in the Environment Agency's *Adapting to Climate Change: Advice for Flood and Coastal Erosion Risk Management Authorities*²¹, which uses science from UKCP09. This guidance is based on Government's policy for climate change adaptation, and is specifically intended for projects or strategies seeking Government Flood Defence Grant in Aid (FDGiA) funding. However, RMAs in England may also find it useful in developing plans and making Flood and Coastal Erosion Risk Management (FCERM) investment decisions even if there is no intention of applying for central government funding. This is important for any future large scale infrastructure used to support the delivery of strategic sites such as flood defence schemes.

Although, it is anticipated that increases in river flows will lie somewhere within the range of the central to upper end estimates of the February 2016 allowances, more extreme change cannot be discounted. The high++ allowances can be used to represent more severe climate change impacts and help to identify the options that would be required. The UKCP09 high++ allowances for peak river flows and relative mean sea level rise are presented in Table 6-13 and Table 6-14 respectively.

Table 6-13: UKCP09 High++ Allowances for Peak River Flow

RBD	2020s	2050s	2080s
Northumbria	+20%	+35%	+65%
Humber	+20%	+35%	+65%

Table 6-14: UKCP09 High++ Allowances for Relative Mean Sea Level Rise

Sea Level Rise up to 2025 (mm/yr)	Sea Level Rise up to 2026-2050 (mm/yr)	Sea Level Rise up to 2051-2080 (mm/yr)	Sea Level Rise up to 2081-2115 (mm/yr)
6	12.5	24	33

6.7 Sustainable Drainage Systems (SuDS)

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and consequently a potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure.

Managing surface water discharges from new development is therefore crucial in managing and reducing flood risk to new and existing development downstream. Carefully planned development can also play a role in reducing the amount of properties that are directly at risk from surface water flooding.

The FWMA, 2010, originally transferred the adoption and maintenance of SuDS to Sustainable Drainage Systems Approval Bodies (SABs) that were to be established by local authorities, or LLFA's, under Schedule 3 of the Act. However, the designation of a SAB has since been removed following lengthy consultation, with the announcement from the Department for Communities and Local Government (DCLG) in December 2014 that local planners will be responsible for delivering SuDS.

Changes to planning legislation give provisions for major applications of ten or more residential units or equivalent commercial development to require sustainable drainage within the development proposals in accordance with the interim national standards published in April 2015.

The system proposed by government builds on the existing planning system, which developers and local authorities are already using. Policy changes to the planning system can also be introduced relatively quickly ensuring that flood risk benefits from sustainable drainage systems can be brought forward as part of planning application proposals.

The NPPF continues to reinforce how planning applications that fail to deliver SuDS above conventional drainage techniques could be rejected and sustainable drainage should form part of integrated design secured by detailed planning conditions so that the SuDS to be constructed must be maintained to a minimum level of effectiveness. Maintenance options must clearly identify who will be responsible for SuDS maintenance and funding for maintenance should be fair for householders and premises occupiers; and, set out a minimum standard to which the sustainable drainage systems must be maintained.

The runoff destination should always be the first consideration when considering design criteria for SuDS including the following possible destinations in order of preference:

1. To ground;
2. To surface water body;
3. To road drain or surface water sewer; or
4. To combined sewer.

Effects on water quality should also be investigated when considering runoff destination in terms of the potential hazards arising from development and the sensitivity of the runoff destination.

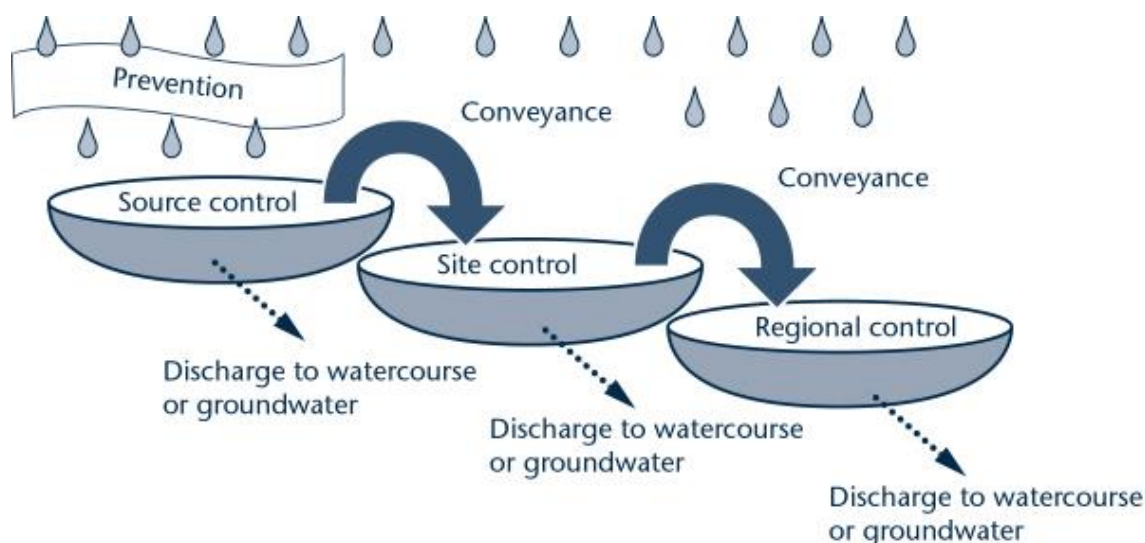
The non-statutory technical standards for sustainable drainage systems²² (March 2015) set out appropriate design criteria based on the following:

1. Flood risk outside the development;
2. Peak flow control;
3. Volume control;
4. Flood risk within the development;
5. Structural integrity;
6. Designing for maintenance considerations; and
7. Construction.

In addition, the Local Planning Authority may set local requirements for planning permission that include more rigorous obligations than these non-statutory technical standards. More stringent requirements should be considered where current Greenfield sites lie upstream of high risk areas. This could include improvements on Greenfield runoff rates. CIRIA has also produced a number of guidance documents relating to SuDS that should be consulted by the LPA and developers.

Many different SuDS techniques can be implemented. As a result, there is no one standard correct drainage solution for a site. In most cases, a combination of techniques, using the Management Train principle (see Figure 6-4), will be required, where source control is the primary aim.

Figure 6-4: SuDS Management Train Principle²³



The effectiveness of a flow management scheme within a single site is heavily limited by land use and site characteristics including (but not limited to) topography; geology and soil (permeability); and available area. Potential ground contamination associated with urban and former industrial sites should be investigated with concern being placed on the depth of the local water table and potential contamination risks that will affect water quality. The design, construction and ongoing maintenance regime of any SuDS scheme must be carefully defined as part of a site-specific FRA. A clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential for successful SuDS implementation.

²² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/415773/sustainable-drainage-technical-standards.pdf

²³ CIRIA (2008) Sustainable Drainage Systems: promoting good practice – a CIRIA initiative
2016s3801 RCBC Level 1 SFRA Update Final Report v1.0.docx

6.8 Emergency Planning

The provisions for emergency planning for local authorities as Category 1 responders are set out by the Civil Contingencies Act, 2004 and the National Flood Emergency Framework for England, December 2014²⁴. This framework is a resource for all involved in emergency planning and response to flooding from the sea, rivers, surface water, groundwater and reservoirs. The Framework sets out the Government's strategic approach to:

- Ensuring all delivery bodies understand their respective roles and responsibilities when planning for and responding to flood related emergencies,
- Give all players in an emergency flooding situation a common point of reference which includes key information, guidance and key policies,
- Establish clear thresholds for emergency response arrangements,
- Place proper emphasis on the multi-agency approach to managing flooding events,
- Provide clarity on the means of improving resilience and minimising the impact of flooding events,
- Provide a basis for individual responders to develop and review their own plans, and
- Being a long-term asset that will provide the basis for continuous improvement in flood emergency management.

Along with the Environment Agency flood warning systems, there are a range of flood plans at a sub-regional and local level, outlining the major risk of flooding and the strategic and tactical response framework for key responders.

This SFRA contains useful data to allow emergency planning processes to be tailored to the needs of the area and be specific to the flood risks faced. The SFRA Maps in Appendix A and accompanying GIS layers provided should be made available for consultation by emergency planners during an event and throughout the planning process. RCBC is however already served by an effective emergency planning group, the Cleveland Emergency Planning Unit.

6.8.1 Cleveland Emergency Planning Unit²⁵

As mentioned in Section 4.4.7, the Cleveland Emergency Planning Unit (CEPU) provides emergency planning and resilience to each of the four local authorities within the former Cleveland area, namely Middlesbrough, Stockton-on-Tees, Hartlepool and Redcar and Cleveland. CEPU state their primary aims of emergency planning are:

- To provide a comprehensive and effective resilience and emergency planning service to the four local authorities,
- To achieve an effective response to all major incidents and emergency situations regardless of their cause,
- To ensure emergency response plans are produced, reviewed, tested and exercised, and
- To ensure the local authorities' meet their statutory obligations and duties under primary legislation such as the Civil Contingencies Act 2004.

6.8.1.1 Civil Contingencies Act

Under the Civil Contingencies Act (CCA, 2004)²⁶, RCBC is classified as a Category 1 responder and has duties to assess the risk of emergencies occurring, and uses this to inform contingency planning; Put in place emergency plans; Put in place Business continuity management arrangements; Put in place arrangements to make information available to the public about civil protection matters and maintain arrangements to warn, inform and advise the public in the event of an emergency; Share information with other local responders to enhance coordination; Cooperate with other local responders to enhance coordination and efficiency and provide advice and assistance to businesses and voluntary organisations about business continuity management.

²⁴ <https://www.gov.uk/government/publications/the-national-flood-emergency-framework-for-england>

²⁵ <http://www.clevelandemergencyplanning.info/>

²⁶ <https://www.gov.uk/preparation-and-planning-for-emergencies-responsibilities-of-responder-agencies-and-others#the-civil-contingencies-act>

During an emergency such as a flood event, the Local Authority must also co-operate with other Category 1 responders (such as the emergency services and the Environment Agency) to provide the core response.

RCBC is part of the Cleveland Local Resilience Forum²⁷ (CLRF), as discussed in Section 4.4.7. The role of the CLRF is to ensure an appropriate level of preparedness to enable an effective multi-agency response to emergency incidents that may have a significant impact on the local communities.

6.8.1.2 Cleveland Community Risk Register

As a strategic decision-making organisation, CLRF prepared the Cleveland Community Risk Register²⁸ (CCRR), which considers the likelihood and consequences of the most significant risks the area faces, including tidal, fluvial and urban flooding and adverse weather situations. This SFRA can help to inform this. The CCRR is considered as the first step in the emergency planning process and is designed to reassure the local community that measures and plans are in place to respond to the potential hazards listed within the CCRR.

6.8.2 Multi-Agency Flood Response Plan (MAFRP)

Local Resilience Forums are required to have generic multi-agency and site-specific plans in place to respond to all emergencies including the development of a specific flood plan due to the complex and diverse nature of flooding and the consequences that arise. Developing a Multi-Agency Flood Response Plan (MAFRP) allows all responders to collaborate on an agreed coordinated response to a severe flood incident. The Detailed Guidance on Developing a Multi-Agency Flood Plan²⁹ (June 2011) document, written by Defra, provides guidance for LRFs on how to develop a MAFFP. The CLRF should decide on the type of flood plan needed (depending on local circumstances) as well as deciding if a MAFFP is to supersede or complement existing flood plans.

RCBC, through CEPU, do not yet have a Multi-Agency Flood Response Plan in place though CEPU do include guidance on their website on what to do in the event a flood, as do RCBC:

<http://www.redcar-cleveland.gov.uk/flooding>

6.8.3 Local Flood Plans

This SFRA provides a number of flood risk data sources that should be used when producing or updating flood plans. RCBC will be unable to write specific flood plans for new developments at flood risk. Developers should write their own. Guidance can be found on the Environment Agency website³⁰ and the CEPU website. Generally, owners with individual properties at risk should write their own individual flood plans, however larger developments or regeneration areas, such as retail parks, hotels and leisure complexes, should consider writing one collective plan for the assets within the area.

This SFRA can help to:

- Update these flood plans if appropriate;
- Inform emergency planners in understanding the possibility, likelihood and spatial distribution of all sources of flooding (emergency planners may however have access to more detailed information);
- Identify safe evacuation routes and access routes for emergency services;
- Identify key strategic locations to be protected in flooding emergencies, and the locations of refuge areas which are capable of remaining operational during flood events;
- Provide information on risks in relation to key infrastructure, and any risk management activities, plans or business continuity arrangements;
- Raise awareness and engage local communities;
- Support emergency responders in planning for and delivering a proportionate, scalable and flexible response to the level of risk; and
- Provide flood risk evidence for further studies.

²⁷ <http://www.redcar-cleveland.gov.uk/rcbcweb.nsf/web+full+list/0f6a7a816e88cdfa802571bd0054cce6>

²⁸ <http://www.clevelandemergencyplanning.info/information-for-residents/>

²⁹ Detailed Guidance on Developing a Multi-Agency Flood Plan, June 2011, Defra

³⁰ <https://www.gov.uk/prepare-for-a-flood/make-a-flood-plan>

6.8.4 Flood Warning and Evacuation Plans

Developments that include areas that are designed to flood (e.g. ground floor car parking and amenity areas) or have a residual risk associated with them, will need to provide appropriate flood warning, evacuation procedures, clear access and egress points and refuge areas so users and residents are safe in a flood. Flood warnings should include both physical warning signs and written flood warning and evacuation plans. Those using the new development should be made aware of any evacuation plans and access and egress routes.

Whilst there is no statutory requirement on the Environment Agency or the emergency services to approve evacuation plans, RCBC is accountable under its Civil Contingencies Act duties, via planning condition or agreement, to ensure that plans are suitable. This should be done in consultation with development management officers. Given the cross cutting nature of flooding, it is recommended that further discussions are held between emergency planners and policy planners / development management officers, the LLFA including drainage engineers and also external stakeholders such as the emergency services, the Environment Agency and Northumbrian Water.

It may be useful for both the LLFA and the LPA spatial planners to consider whether, as a condition of planning approval, flood evacuation plans should be provided by the developer which aim to safely evacuate people out of flood risk areas, using as few emergency service resources as possible. The application of such a condition is likely to require policy support in the new Local Plan, and discussions within the Cleveland Local Resilience Forum and the Cleveland Emergency Planning Unit are essential to establish the feasibility / effectiveness of such an approach, prior to it being progressed. It may also be useful to consider how key parts of agreed flood evacuation plans could be incorporated within local development documents, in terms of protecting evacuation routes and refuge / assembly areas from inappropriate development.

Once the development goes ahead, it will be the requirement of the plan owner (developer) to make sure the plan is put in place, and to liaise with RCBC regarding maintenance and updating of the plan.

6.8.4.1 What should the flood warning plan include?

Flood warning and evacuation plans should include the information stated in Table 6-15. Advice and guidance on plans is accessible from the Environment Agency website and there are templates available for businesses and local communities.

Table 6-15: Flood warning and evacuation plans content

Consideration	Purpose
Availability of existing flood warning system	The Environment Agency offers a flood warning service that currently covers designated Flood Warning Areas in England and Wales. Within these areas, they are able to provide a full flood warning service.
Rate of onset of flooding	The rate of onset is how quickly the water arrives and the speed at which it rises which, in turn, will govern the opportunity for people to effectively prepare for and to respond to a flood. This is an important factor within emergency planning in assessing the response time available to the emergency services.
How flood warning is given and occupants awareness of the likely frequency and duration of flood events	Everyone eligible to receive flood warnings should be signed up to the Environment Agency flood warning service. Where applicable, the display of flood warning signs should be considered, in particular sites that will be visited by members of the public on a daily basis such as sports complexes, car parks and retail stores. It is envisaged that the responsibility for this would fall upon the developers and should be a condition of the planning permission. Information should be provided to new occupants of houses concerning the level of risk and subsequent procedures if a flood occurs.
The availability of staff / occupants / users to respond to a flood warning and the time taken to respond to a flood warning	The plan should identify roles and responsibilities of all responders. The use of community flood wardens should also be considered.
Designing and locating safe	Dry routes will be critical for people to evacuate as well as

Consideration	Purpose
access routes, preparing evacuation routes and the identification of safe locations for evacuees	emergency services entering the site. The extent, depth and flood hazard rating should be considered when identifying these routes.
Vulnerability of occupants	Vulnerability classifications associated with development as outlined in the FRCC-PPG. This is closely linked to its occupants.
How easily damaged items will be relocated and the expected time taken to re-establish normal use following an event	The impact of flooding can be long lasting well after the event has taken place affecting both the property which has been flooded and the lives that have been disrupted. The resilience of the community to get back to normal will be important including time taken to repair / replace what has been damaged as a result.

6.8.5 Flood Awareness

Emergency planners may also use the outputs from this SFRA to raise awareness within local communities. This should include raising awareness of flood risks, roles, responsibilities and measures that people can take to make their homes more resilient to flooding from all sources whilst also encouraging all those at fluvial flood risk to sign up to the Environment Agency’s Floodline Warnings Direct³¹ service.

It is also recommended that Category 1 responders are provided with appropriate flood response training to help prepare them for the possibility of a major flood with an increased number of people living within flood risk areas, to ensure that adequate pre-planning, response and recovery arrangements are in place.

7 Conclusions and Recommendations

7.1 Conclusions

This SFRA provides a single repository planning tool relating to flood risk and development in Redcar and Cleveland Borough. It has consulted key flood risk stakeholders namely the Environment Agency and Northumbria Water to collate all available and relevant flood risk information on all sources into one comprehensive assessment. Together with this report, this SFRA also provides a suite of interactive GeoPDF flood risk maps (Appendix A) and a development site assessment spreadsheet (Appendix B) illustrating the level of risk to sites, with subsequent recommendations. All GIS data used in creating the maps and spreadsheets is included within this SFRA and held by the LPA.

The flood risk information, assessment, guidance and recommendations of the SFRA will provide strategic planners with the evidence base required to apply the Sequential and Exception Tests, as required under the NPPF, and demonstrate that a risk-based, sequential approach has been applied in the preparation of their development plans and documents. This will allow for a sustainable and robust new Local Plan.

Whilst the aim of the sequential approach is the avoidance of high flood risk areas, in locations such as the industrial north-west of the borough, where the council strives for continued growth and regeneration, this will not always be possible. This SFRA therefore provides the necessary links between spatial developments, wider flood risk management policies, local strategies / plans and on the ground works by bringing flood risk information into one location.

As this is a strategic study, detailed local information on flood risk is not however fully accounted for. For a more detailed assessment of specific areas or sites, refer to the Level 2 SFRA published in 2010 which has examined high risk areas in more detail. RCBC consider the Level 2 SFRA to still be appropriate for the purposes it was originally commissioned and thus not requiring of an update.

7.2 Planning Policy and Flood Risk Recommendations

The following planning policy recommendations relating to flood risk are designed to enable the Council to translate the information provided in this SFRA into meaningful Local Plan policy for flood risk and water management:

Policy Recommendation 1: No development within Flood Zone 3b...

...as per the NPPF and FRCC-PPG, unless in exceptional circumstances such as for essential infrastructure or where development is water compatible. The Exception Test would still need to be undertaken and passed were essential infrastructure required in Flood Zone 3b.

Development must not impede the flow of water within Flood Zone 3b nor should it reduce the volume available for storage of flood water.

Refer to tables 1 to 3 of the FRCC-PPG

Policy Recommendation 2: Sequential approach to site allocation and site layout...

...must be followed by the LPA to ensure sustainable development when either allocating land in Local Plans or determining planning applications for development.

The overall aim of the Sequential Approach should be to steer new development to low risk Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the flood risk vulnerability of land uses and reasonably available sites in Flood Zone 2 should be considered, applying the Exception Test if required.

Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in higher risk Flood Zone 3, be considered. This should take into account the flood risk vulnerability of land uses and the likelihood of meeting the requirements of the Exception Test if required.

This SFRA and the NPPF and FRCC-PPG should be consulted throughout this process.

Policy Recommendation 3: Requirement for a site-specific Flood Risk Assessment...

...from a developer when a site is:

- Within Flood Zone 3a or Flood Zone 2
- Within Flood Zone 1 but ≥ 1 hectare in size
- At risk from surface water
- Situated in an area currently benefitting from defences
- Situated within 20 m of the bank top of a Main River
- Situated over a culverted watercourse or where development will be required to control or influence the flow of any watercourse

Before deciding on the scope of the FRA, this SFRA should be consulted along with the LPA, LLFA and EA. The FRA should be submitted to and approved by the LPA including suitable consultation with the LLFA and the EA.

Policy Recommendation 4: Use of appropriately sourced of SuDS...

...required for all major developments of 10 or more residential units or equivalent commercial development. This is in accordance with the interim national standards published in April 2015.

SuDS scoping and design, as part of a site-specific FRA, must be included within the early stages of the site design in order to incorporate appropriate SuDS within the development.

The LPA, LLFA, EA must be consulted during the design stage and the FRA must be submitted to and approved by the LPA including suitable consultation with the LLFA and the EA.

Maintenance options must clearly identify who will be responsible for SuDS maintenance and funding for maintenance should be fair for householders and premises occupiers. A minimum standard to which the sustainable drainage systems must be maintained should be agreed.

Policy Recommendation 5: Phasing of development...

...should be carried out by the LPA to avoid any cumulative impacts of flood risk.

Using a phased approach to development, should ensure that any sites at risk of causing flooding to other sites are developed first in order to ensure flood storage measures are in place before other sites are developed, thus ensuring a sustainable approach to site development.

It may be possible that flood mitigation measures put in place at sites upstream could alleviate flooding at downstream or nearby sites.

Policy Recommendation 6: Planning permission for at risk sites...

...can only be granted by the LPA where a site-specific Flood Risk Assessment shows that:

- The NPPF and FRCC-PPG have been referenced together with appropriate consultation with the LLFA, the EA and Northumbrian Water, where applicable
- The effects of climate change have been taken into account
- There is no loss in floodplain storage resulting from the development
- The development will not increase flood risk elsewhere
- There is no adverse effect on the operational functions of any existing flood defence infrastructure
- Proposed resistance / resilience measures designed to deal with current and future risks are appropriate
- Appropriate SuDS techniques have been considered and are to be incorporated into the design of the site, where applicable
- Whether the development will be safe and pass the Exception Test, if applicable

7.3 Recommendations for Further Work

This SFRA process has developed into more than just a planning tool. Sitting alongside the Redcar and Cleveland Borough PFRA and SWMPs, it can be used to provide a much broader and inclusive vehicle for integrated, strategic and local flood risk management and delivery.

There are a number of plans and assessments listed in Table 7-1 that would be of benefit to RCBC in developing their flood risk evidence base to support the delivery of their new Local Plan or to help fill critical gaps in flood risk information.

7.3.1 Level 2 SFRA

The Council should review the sites where they expect the main housing numbers and employment sites to be delivered, using Section 6.5 of this report, the SFRA Maps in Appendix A and the Development Site Assessment spreadsheet in Appendix B. At the time of writing, the council do not consider it necessary to produce an updated Level 2 assessment, based on the strategic analysis of risk in this Level 1 study.

However, a Level 2 SFRA may be required if any forthcoming large sites, or groups of sites, within Flood Zone 3 are required and have strategic planning objectives, which means they cannot be relocated or avoided. A Level 2 SFRA may also be required if the majority of any future sites are within Flood Zone 2 or are at significant risk of surface water flooding. Residual flood risk should also be taken account of when considering options for future work.

A Level 2 SFRA should build on the source information provided in this Level 1 assessment and should show that a site will not increase risk to others and will be safe, once developed. A Level 2 study may also assess, in detail, locations and options for the implementation of open space, or Green Infrastructure, to help manage flood risk in key areas.

The LPA will need to provide evidence in their new Local Plan to show that the housing numbers (and other sites) can be delivered. The new Local Plan may be rejected if a large number of sites require the Exception Test to be passed but with no evidence that this will be possible.

Once all sites within this Level 1 assessment have been reviewed by the LPA then further advice or guidance should be sought to discuss possible next steps.

Table 7-1: Recommended Further Work

Type	Study	Explanation	Timeframe
Understanding of local flood risk	EA FRM studies	Various EA modelling studies continue to be carried out by RCBC	Ongoing where required
Understanding of local flood risk	Level 2 SFRA / FRAs	Further, more detailed assessment of flood risk to key sites	Short term
Flood storage	Community Infrastructure Levy (CIL)	For new developments, Green Infrastructure or open space assets can be secured from a landowner's 'land value uplift' and as part of development agreements. The LPA could include capital for the purchase, design, planning and maintenance of GI within its CIL programme.	Short term
Data Collection	Flood Incident Data	RCBC has a duty to investigate and record details of locally significant flood events within their area. General data collected for each incident, should include date, location, weather, flood source (if apparent without an investigation), impacts (properties flooded or number of people affected) and response by any RMA.	Short Term / Ongoing
Data collection	Asset Register	RCBC should continue to update and maintain their register of structures and features, which are considered to have an effect on flood risk.	Ongoing
Risk assessment	Asset Register Risk Assessment	RCBC should carry out a strategic assessment of structures and features on the Asset Register to inform capital programme and prioritise maintenance programme.	Ongoing
Capacity	SuDS review / guidance	RCBC should identify internal capacity required to deal with SuDS applications, set local specification and set policy for adoption and maintenance of SuDS.	Short Term, under review
Partnership	Northumbrian Water	RCBC should continue to work with Northumbrian Water on sewer and surface water projects.	Ongoing
Partnership	Environment Agency	RCBC should continue to work with the EA on fluvial and tidal flood risk management projects. RCBC should also identify potential opportunities for joint schemes to tackle flooding from all sources.	Ongoing
Partnership	Community	Continued involvement with the community through RCBC's existing flood risk partnerships.	Ongoing

Appendices

A SFRA Maps

SFRA Interactive GeoPDFs

Open the Index Map in Adobe Acrobat. The index maps contain a set of index squares covering different areas of the borough. Clicking on an index square will open up a more detailed map of that area by way of a hyperlink. Within Adobe Acrobat, use the zoom tools and the hand tool to zoom in/out and pan around the maps. In the legend on the right-hand side of the detailed maps, layers can be switched on and off when required. The potential development site reference labels can also be switched on and off if, for example the smaller sites are obscured by the labels.

B Development Site Assessment Spreadsheet

Excel spreadsheet containing an assessment of flood risk to potential sites based on the Environment Agency's Flood Map for Planning Flood Zones 2 and 3 and the functional floodplain delineated from this SFRA, and also the updated Flood Map for Surface Water (uFMfSW).

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