Dover District Council

Strategic Flood Risk Assessment

September 2007

FINAL REPORT

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CONTRACT

This report describes work commissioned by Dover District Council under letter dated 20 April 2007. Dover District Council's representative for the contract was David Whittington. Philip Soar, Rachel Huitson and Sebastian Bentley of JBA Consulting carried out the work.

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PURPOSE

This document has been prepared solely as a Strategic Flood Risk Assessment Report for Dover District Council. JBA Consulting accepts no responsibility or liability for any use that is made of this document other than by Dover District Council for the purposes for which it was originally commissioned and prepared.

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ABBREVIATIONS

AEP	Annual Exceedance Probability
AONB	Area of Outstanding Natural Beauty
CC	Climate Change
CFMP	Catchment Flood Management Plan
DDC	Dover District Council
DDLP	Dover District Local Plan
DEFRA	Department for the Environment, Food and Rural Affairs
EA	Environment Agency
FRA	Flood Risk Assessment
FZ	Flood Zone
GDPO	General Development Procedure
ha	Hectare
JBA	Jeremy Benn and Associates
LDD	Local Development Document
LDF	Local Development Framework
LPA	Local Planning Authority
MSW	Making Space for Water
OS NGR	Ordnance Survey National Grid Reference
PPG25	Planning Policy Guidance Note 25
PPS25	Planning Policy Statement 25
RFRA	Regional Flood Risk Appraisal
RIZ	Rapid Inundation Zones
RPB	Regional Planning Bodies
SEP	South East Plan
SFRA	Strategic Flood Risk Assessment
SFRT	Sequential Flood Risk Test
SMP	Shoreline Management Plan
SSSI	Site of Specific Scientific Interest
SUDS	Sustainable Drainage System
WLMP	Water Level Management Plan

GLOSSARY

Actual Risk		The risk posed to development situated within a defended area (i.e. behind defences), expressed in terms of the probability that the defence will be overtopped, and/or the probability that the defence will suffer a structural failure, and the consequence should a failure occur
Area vulnerable to flooding from other sources		An area within Deal that following intense rainfall and/or sea spay has a high risk of flooding.
Plan Document	DPD	A mandatory document, the Allocations Development Plan Document is a high priority item for preparation, details of which are provided in the Local Development Scheme. Prepared in conformity with the Core Strategy, once approved, the Allocations Document will identify sites for development as part of the delivery of the overall planning strategy for the area.
Brownfield		Brownfield (sites or land) is a term in common usage that may be defined as 'development sites or land that has previously been developed'. Prior to PPS25 the term 'Brownfield' was used in Governmental Guidance and Statements, but in PPS25 has been replaced with 'Previously-developed land' See 'Greenfield'.
Catchment Flood Management Plan	CFMP	A strategic planning tool through which the Environment Agency will seek to work with other key decision-makers within a river catchment to identify and agree policies for sustainable flood risk management
Compensatory Storage		A floodplain (flood storage) area introduced to compensate for the loss of storage as a result of filling for development purposes
Core Strategy	CS	This is the strategic vision of the area and is a central pillar of the Local Development Framework, comprising: A vision; Strategic objectives; A spatial land use strategy; Core policies and; A monitoring and implementation framework. The Core Strategy is a Development Plan Document which will determine overall patterns of future development, identifying broad locations where future growth or conservation will take place. All other Development Plan Documents should be in broad conformity with the Core Strategy Document. The Core Strategy is a mandatory document, and a timetable for production is set out within the Local Development Scheme.
Defended Area		An area offered a degree of protection against flooding through the presence of a flood defence structure

DG5 register	DG5	Register held by water companies on the location of properties at risk of sewage related flooding problems
Development Plan Documents	DPDs	These documents have Development Plan Status and consequently form part of the statutory development plan for the area. A DPD will be subject to a independent examination. Typical documents that will have DPD status include the Core Strategy, Site-specific Allocations of Land, Proposals Map, and Area Actions Plans (where needed).
Extreme Flood Outline	EFO	Flood 'zone' maps released by the Environment Agency in June 2004 depict anticipated 0.1% (1 in 1000 year) flood extents in a consistent manner throughout the UK
Flood Risk Management		The introduction of mitigation measures (or options) to reduce the risk posed to property and life as a result of flooding. It is not just the application of physical flood defence measures
Formal Defence		A flood defence asset that is maintained by the Environment Agency
Flood Estimation Handbook	FEH	Provides current methodologies for estimation of flood flows for the UK
Floodplain		Any area of land over which water flows or is stored during a flood event or would flow but for the presence of defences
Flood Risk Assessment	FRA	A detailed site-based investigation that is undertaken by the developer at planning application stage
Flood Risk Vulnerability Classification		Refer to Section 4.2
Fluvial Flooding		Flooding caused by the overtopping of river or stream banks
Freeboard		A 'safety margin' to account for residual uncertainties in water level prediction and/or structural performance, expressed in mm
Functional Floodplain		An area of land where water has to flow or be stored in times of flood (fluvial, not tidal).
Greenfield		Greenfield (sites or land) is a term in common usage that may be defined as 'development sites or land that has not previously been developed'. Prior to PPS25 the term 'Greenfield' was used in Governmental Guidance and Statements, but in PPS25 has been replaced with 'Undeveloped land' See 'Brownfield'.
Informal Defence		A structure that provides a flood defence function, however is not owned nor maintained by the Environment Agency
JFLOW		2-Dimension hydraulic modelling package developed by JBA

Local Development Framework	LDF	The Local Development Framework is made up of a series of documents that together will form part of the Development Plan. Broadly Local Development Framework documents fall into two categories: Development Plan Documents Supplementary Planning Documents
Local Development Scheme	LDS	A Local Development Scheme is a public statement of the Council programme for the preparation of Local Development Documents which will form the Local Development Framework.
LPA Proposals Map		This is an Ordnance Survey based map that spatially illustrates policies and proposals within LDDs. The Proposals Map will show planning policy designations and land allocations identified within DPDs; statutory land use and landscape designations; and other land and area based designations. It will form part of the statutory development plan.
Main River		A watercourse designated by DEFRA, that is regulated and maintained by the Environment Agency using their permissive powers
Measure		A deliverable solution that will assist in the effective management (reduction) of risk to property and life as a result of flooding, e.g. flood storage, raised defence, effective development control and preparedness, and flood warning
Mitigation		The management (reduction) of flood risk
Option		Refer 'measure'
PAG2		Project Appraisal Guidance (PAG) 2 (Strategic Planning) outlines the DEFRA requirements against which the Environment Agency must demonstrate that they are managing flood risk in a strategic (catchment wide) manner
Probability	1%	A measure of the chance that an event will occur. The probability of an event is typically defined as the relative frequency of occurrence of that event, out of all possible events. Probability can be expressed as a fraction, % or a decimal. For example, the probability of obtaining a six with a shake of a fair dice is 1/6, 16% or 0.166. Probability is often expressed with reference to a time period, for example, annual exceedance probability
Rapid Inundation Zone		An area immediately behind defences which, should they fail, will generate a combination of high velocities and flood depths that would cause a risk to life.
Residual Risk		The risk that inherently remains after implementation of a mitigation measure (option)
Return Period		The expected (mean) time (usually in years) between the exceedance of a particular extreme threshold. Return period is traditionally used to express the frequency of occurrence of an event, although it is often misunderstood as being a

		probability of occurrence.
Risk		The threat to property and life as a result of flooding, expressed as a function of probability (that an event will occur) and consequence (as a result of the event occurring)
Scheme		An engineering solution that will assist in the management (reduction) of risk to property and life as a result of flooding
Sequential Flood Risk Test	SFRT	The assessment and 'categorisation' of flood risk on a catchment-wide basis in accordance with PPS25.
Shoreline Management Plan	SMP	Non Statutory plan to provide sustainable coastal defence policies. They are prepared by Coastal Defence Groups
Standard of Protection	SoP	The return period to which properties are protected against flooding
Strategic Flood Risk Assessment	SFRA	The assessment of flood risk on a catchment-wide basis for proposed development in a District
Strategic Flood Risk Management	SFRM	Considers the management of flood risk on a catchment-wide basis, the primary objective being to ensure that the recommended flood risk management 'measures' are sustainable and cost effective
Supplementary Planning Documents	SPD	Supplementary Planning Documents or SPD support DPDs in that they may cover a range of issues, both thematic and site specific. Examples of SPD may be design guidance or development briefs. SPD may expand policy or provide further detail to policies in a DPD. They will not be subject to independent examination.
Sustainable (Urban) Drainage System	SUDS	Current 'best practice' for new urban development that seeks to minimise the impact upon the localised drainage regime, e.g. through the use of pervious areas within a development to reduce the quantity of runoff from the site
Tidal Flooding		Flooding caused as a result of tidal activity
Uncertainty		A reflection of the (lack of) accuracy or confidence that is considered attributable to a predicted water level or flood extent
Washland		A flood storage area that is bounded by raised embankments to contain floodwaters

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1 INTRODUCTION

1.1 Background

In April 2007 JBA Consulting were commissioned by Dover District Council (DDC), in partnership with the Environment Agency, to undertake the Dover District Strategic Flood Risk Assessment (SFRA).

This SFRA has been prepared in accordance with current best practice, Planning Policy Statement 25 *Development and Flood Risk* (PPS25)[1]. The SFRA will assist the Council to make the spatial planning decisions required to inform the Local Development Framework (LDF).

The SFRA is a planning tool that enables Councils to select and develop sustainable allocations away from flood risk areas. The assessment focuses on proposed and existing allocations within the districts but also sets out the procedure to be followed when assessing additional sites for development in the future.

The SFRA should be treated as a 'dynamic' document that is periodically reviewed as further information becomes available to provide a better understanding of flood risk, for example strategy reports or additional modelling, or if conditions change that impact on the nature of flood risk, for example the presence and characteristics of flood defences.

1.2 Scope and objectives

The overall objective for this SFRA is to provide sufficient information for the application of the Sequential Test and to identify whether application of the Exception Test is likely to be necessary. It involves a broadscale assessment of flood risk to identify sites at flood risk from fluvial, coastal and other sources of flooding, utilising existing available information. In addition to this, the final SFRA will allow DDC to:

- prepare appropriate policies for the management of flood risk within their district
- inform the sustainability appraisal so that flood risk is taken account of when considering options and in the preparation of strategic land use policies
- identify the level of detail required for site-specific Flood Risk Assessments (FRA) in particular locations, and
- enable them to determine the acceptability of flood risk in relation to emergency planning capability.

1.3 Study area

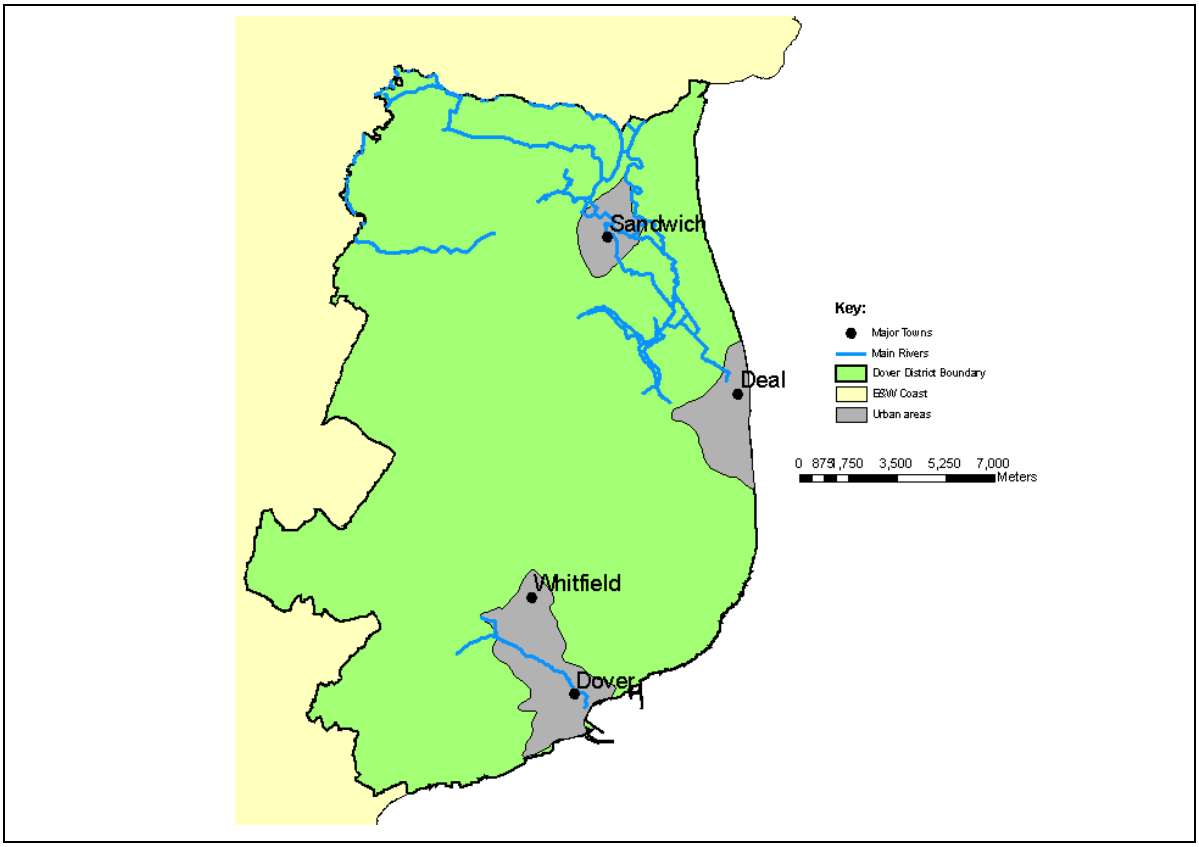
This study comprises the local authority area of Dover District Council, covering an area of 31,930ha and having a population in excess of 102,000 people, and to date, most of the significant urban development has occurred along the coast, with dispersed smaller villages further in land. The important urban areas within the district boundary are Dover, Deal and Sandwich, as illustrated in Figure 1-1. In addition to these main towns, DDC's other key site that lies outside of the Flood Risk Zone is Whitfield.

Flood risk to the district is dominated by tidal flooding, although the key settlements of Dover and Sandwich have the additional risk from fluvial flooding, from the River Dour and River Stour, respectively. Coupled with this, much of the coastal plains area is characterised by marshy areas made up of a series of drains, presenting a different type of flood risk.

In the lower lying areas of the district, groundwater is another primary source of flooding, a result of the predominant chalk geology. Maps illustrating an overview of the soil and geology of the district are provided in Appendix B.

[1] Planning Policy Statement 25: Development and Flood Risk – December 2006

Figure 1-1 Dover District Location Plan



A large proportion of the Dover District is agricultural land, which is mainly used for arable farming. The agricultural land in Sandwich is particularly important and is recognised by the Agricultural Land Classification as Grade 1 land, 'the best and most versatile quality', although a significant area of this is at risk of flooding from both fluvial and tidal flooding. As well as good quality agricultural land, there are large areas of managed grassland and forestry within the Dover District boundary.

The Dover District also has a rich archaeological heritage with over 2,800 listed buildings and 57 conservation areas. There is a vast array of open spaces in the Dover District including major municipal parks, gardens, local nature reserves, promenades, sports pitches and various informal grass areas.

Deprivation and unemployment figures are high for the urban centre of Dover, with many wards in Dover placed in the worst 10% deprived areas in England. The current major employment locations are the Port of Dover and the various industrial estates around Sandwich.

The key transport routes are the A2 and A20.

The fluvial topography of the region is characterised by valleys which are typically 'u-shaped' with very flat bottoms and steep valley sides. This landscape character has an impact on flooding in the region as the extent is constrained by the steep valley sides, so once the valley bottom is inundated with water, any further increases in flooding generally leads to greater depths rather than an increase in the spatial extent.

River Stour:

Most of the Lower Stour through Sandwich is at or near sea level, flowing through a very flat and wide floodplain. The Lower Stour is tidal up to Fordwich and is embanked in its lower reaches to prevent flooding to, mainly, agricultural land.

River Dour:

The River Dour is characterised by a steep sided valley, with the floodplain widening towards the coast. It flows almost entirely through urban areas including Temple Ewell, Kearsney, Crabble Mill,

Buckland and Dover itself. It discharges into Wellington Dock at Dover. The Dour catchment is underlain by chalk and is affected by groundwater abstractions for public water supply. The watercourse is heavily modified but could still be a source of flooding due to the flashy response to urban water run-off from Dover. In addition to this, the upper reaches are also subject to flooding, with incidences being reported in Alkham Valley.

1.4 Main sources of flooding

The main sources of flooding in the Dover District are the sea and, to a lesser extent, the River Dour through Dover and the River Stour through Sandwich. The Dover District coastline is particularly vulnerable to exceptional sea levels arising from a combination of high tides, storm surge, action of exceptional wave heights and the joint impacts of fluvial and tidal levels (particularly through Sandwich on the River Stour).

The most severe flooding would be through either a breach in a coastal defence structure or through the defence structure overtopping. The area at greatest risk of flooding is north Deal, where the coastal defence structures are at greatest risk of breaching.

In addition, the collection of spray-water from waves crashing against the coastal defences in Deal provides a flood risk in itself.

Flooding along watercourses in urban areas can, in some cases, be associated with the surcharge of subsurface drainage systems or the blockage of structures (e.g. culverts, outfalls or bridges).

1.5 Existing flood defence infrastructure

There are numerous flood defence schemes located along the coastline and the River Stour in the Dover District. The following information on flood defence infrastructure has been taken from the Pegwell Bay to Kingsdown Coastal Strategy[2]:

- Dunes from Pegwell Bay to Sandwich Bay Estate - The dune system offers protection against flooding at this location, there are no formal man-made defences. They are of good condition and do not require any immediate repair works
- Embankment along Royal Cinque Ports Golf Links - An earth/colliery shale embankment provides flood protection at this location. The shingle beach provides protection to the embankment. The Environment Agency re-profiles the beach annually to maintain this protection. The embankment is in a good condition; however the section nearest to Sandown Castle only offers protection up to a 1 in 1 year (100% AEP) tidal flood event. The rest of the defence offers protection up to a 1 in 200 year (0.5% AEP) tidal flood event.
- Sea wall south of Deal Pier - Flood protection is provided by the sea wall at this location, comprising a recurved concrete wall founded on steel sheet piles. The seawall is in a good condition but only offers flood protection up to a 1 in 1 year (100% AEP) tidal flood event.
- 200m south of Deal Pier to Kingsdown - Natural shingle ridge and embankment that requires continual maintenance work to retain the protection it offers.
- Right bank of River Stour at Sandwich Haven bend - A brick flood wall has been built here to prevent overtopping, offering flood protection up to a 1 in 200yr (0.5% AEP) fluvial flood event.
- Right bank of River Stour from Toll Bridge to Guestling Mill - The defence here comprises a reinforced brick flood wall on top of the river channel retaining wall. This offers flood protection up to a 1 in 50 year (2% AEP) fluvial flood event.
- Left bank of River Stour along the southern boundary of Pfizer - The defence here comprises a gabion wall and offers flood protection up to a 1 in 50 year (2% AEP) fluvial flood event.
- Left bank of River Stour at the industrial estate for a proposed new housing development - The defence here comprises a sheet piling wall. The standard of protection for this defence is unknown.

[2] Environment Agency and Dover District Council – Pegwell Bay to Kingsdown Coastal Strategy (2007) – Halcrow.

- There are numerous pumping stations located in the Hacklinge Marsh area that help to manage water levels during low return period flood events. These are not effective during higher return period flood events, e.g. a 1 in 100 year (1% AEP).

This information has been utilised in this SFRA to identify areas at greatest risk of flooding from flood defence overtopping or failure. Locations of flood defences are shown in Map B-5 of Appendix B.

1.6 Historical Flooding

Historical flooding events and issues have been identified and assessed using a number of information sources, including:

- The Stour Catchment Flood Management Plan;
- Pegwell Bay to Kingsdown Coastal Strategy;
- Lower Stour Flood Study;
- Environment Agency knowledge and guidance.
- Internet searches

The major events identified through the use of this information are noted below. The latter event occurred during the course of the study, and although not of the same magnitude as the other events listed, did provide supporting evidence when assessing areas of flood risk.

- 1953 tidal flood event
- 11th January 1978 – Fluvial flooding of drains in Stour marshes;
- February 1983 – Tidal surge overtopped right bank of Stour through Sandwich, affecting 16 properties in total;
- February 2001 – Fluvial flooding in Dover on top of a high watertable following a wet winter;
- 27th September 2003 – Excess runoff caused flooding in the London Road area of Dover following intense storm;
- June 2007 – affected parts of Sandwich, Deal and Dover following torrential rain[3]

Locations affected by these flood events will be considered in this SFRA to ensure these are highlighted as potential flood risk areas.

The locations of historical flood events highlighted throughout this report are shown in Map B-6 of Appendix B.

1.7 Proposed development options

As part of their Local Plan, DDC has in excess of 100 proposed residential development sites that have been divided into four growth options as outlined below. This SFRA has addressed all sites, which are documented in Chapter 5.

- Option 1: continues development at the current rate, providing 6,000 houses
- Option 2: allocation of 8,000 – considered by the Council to be insufficient to meet targets
- Option 3: allocation of 10,000 houses (preferred option)
- Option 4: allocation of 14,000 houses.

In addition to the housing allocations, there are several employment sites that target the key urban settlements.

The locations of all proposed housing and employment allocations are illustrated in Map 1.

[3] http://news.bbc.co.uk/1/hi/england/kent/6220880.stm (accessed 20/06/2007)

2 THE PLANNING FRAMEWORK

2.1 Introduction

Flood risk is only one of many factors that influence land-use decisions and the SFRA is designed to assist planners in considering flood risk. The entire planning process is informed by planning legislation/guidance generated at all levels of government. The use of the SFRA ensures that flood risk at a local level is assessed with regard to policy documents, guidance notes and legislation issued at regional and national scales. A summary of the principal acts, guidance, strategies and plans of relevance to the Dover District are presented in Table 2-1.

Table 2-1 Reviewed National and Regional Strategies and Plans for the Dover District

Strategy, Plan	Abbreviation	Published by	Period Covered / Date Published
National Strategies			
Planning and Compulsory Purchase Act		HM Government	2004
Planning Policy Statement 1 Delivering Sustainable Development	PPS1	Communities and Local Government Office	2005
Planning Policy Statement 12 Local Development Frameworks	PPS12	Communities and Local Government Office	2004
Planning Policy Statement 25 Development and Flood Risk	PPS25	Communities and Local Government Office	2006
Planning Policy Statement 3 Housing	PPS3	Communities and Local Government Office	2006
Planning Policy Statement 4 Industrial and Commercial Development and Small Firms	PPS4	Communities and Local Government Office	1997
Planning Policy Statement 6 Planning for Town Centres	PPS6	Communities and Local Government Office	2005
Making Space for Water – Government strategy for flood and coastal erosion risk management	DEFRA MSW	DEFRA	March 2005
Regional Strategies			
River Stour Catchment Flood Management Plan	Stour CFMP	Environment Agency	September 2006
Regional Flood Risk Appraisal for South East Plan	SE RFRA	South East England Regional Assembly	November 2006
Kent and Medway Structure Plan	KMSP	Kent and Medway County Councils	2006
South East Plan	SEP	South East England Regional Assembly	2006
Local Strategies			
Dover District Local Plan	DDLP	Dover District Council	2002
Sandwich Bay and Hacklinge Marshes Water Level Management Plan	WLMP	Environment Agency	2006

2.2 National Planning Policy

A précis of the most relevant National Policy to this SFRA, Planning Policy Statement 25 (PPS25) is provided below, and further summaries of some of the other key National Policies documented in Table 2-1 are presented in Appendix A.

2.2.1 Planning Policy Statement 25 (PPS25): Development and Flood Risk

The introduction of PPG25 in July 2001 reinforced the responsibility of LPAs to ensure that flood risk is understood and effectively managed using a risk-based approach as an integral part of the planning process. PPG25 represented a marked shift from the reactive resolution of flooding problems as a result of development (i.e. flood defence) to the effective management of flood risk within the planning system.

Development must facilitate the socio-economic needs of a community, and spatially must sit within an existing framework of landscape and infrastructure. For this reason, a balance must be sought between development need and the risk posed to existing and future development in an area.

The Government has set an objective for the Environment Agency to reduce the risks to people and to the developed and natural environment from flooding. In response to this the Environment Agency has set a target to seek to influence planning activities to prevent 100% of inappropriate development inside floodplains.

The role of the Environment Agency is to provide advice to LPAs to ensure the management of flood risk in an effective manner as part of the planning process. To facilitate the delivery of this role and to inform the planning process, LPAs are encouraged to undertake a Sequential Flood Risk Test (SFRT). This Test is intended to provide a rigorous understanding of flood risk within their area, delineating the extent and nature of flooding in accordance with the flood risk zones set out within PPG25. This must consider the planning context and provide the framework for effective and sustainable flood risk management within areas where a balance between susceptibility-to-flooding and wider spatial planning pressures is required.

Catchment boundaries often cover more than one planning district, therefore it is imperative that the planning process ensures that adopted policies are consistent with the longer term vision for the wider catchment, and take adequate account of the impacts that the decisions made may have upon adjoining districts.

It is generally agreed that PPG25 worked well, and highlighted the importance of flood risk in the development process. The role of PPS25 is to build upon PPG25, to focus on core policies and be clearer and easier to understand than PPG25. It includes clarification of the Sequential Test, which matches types of development against levels of flood risk in order to direct the more sensitive land uses into lower risk areas.

PPS25 was issued as a consultation draft in December 2005 and the final version replaced PPG25 in December 2006. An accompanying Practice Guide is also available.

In revising PPG25, the Government sought to provide clarity on what is required at a regional and local level to ensure that appropriate and timely decisions are made to deliver sustainable planning for development. The key planning objectives are as follows:

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

- *Identifying land at risk and the degree of risk of flooding from river, sea and other sources in their areas*
- *Preparing Regional or Strategic Flood Risk Assessments (RFRAs / SFRAs) as appropriate, as a freestanding assessment that contributes to the Sustainability Appraisal of their plans.*
- *Framing policies for the location of development which avoid flood risk to people and property where possible, and manage any residual risk, taking account of the impacts of climate change*

- *Only permitting development in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding*
- *Safeguarding land from development that is required for current and future flood management e.g. conveyance and storage of flood water, and flood defences*
- *Reducing flood risk to and from new development through location, layout and design, incorporating sustainable drainage systems (SUDS)*
- *Using opportunities offered by new development to reduce the cause and impacts of flooding e.g. surface water management plans; making the most of the benefits of green infrastructure for flood storage, conveyance and SUDS; re-creating functional floodplain; and setting back defences*
- *Working effectively with the Environment Agency, other operating authorities and other stakeholders to ensure that best use is made of their expertise and information so that plans are effective and decisions on planning applications can be delivered expeditiously*
- *Ensuring spatial planning supports flood risk management policies and plans, River Basin Management Plans and emergency planning."*[4]

The Sequential Test is a key part of PPS25, which steers new development to areas at the lowest risk of flooding. In addition, PPS25 introduces the Exception Test, which allows limited scope for departures from the sequential approach where development is essential to meet the wider aims of sustainable development. When the use of the Exception Test is required, decision makers should apply it at the earliest stage in the preparation of all Local Development Documents (LDDs). All three elements of the Exception Test need to be passed before development is permitted.

PPS25 clarifies that the potential impacts of climate change should be addressed in Flood Risk Assessments. It includes advice on current sources of information on climate change including, Consultation- Planning Policy Statement Planning and Climate Change- Supplement to Planning Policy Statement 1[5], to ensure that plans and planning decisions are fully informed about climate change.

PPS25 also uses the amendment to Article 10 of the Town and Country Planning (General Development Procedure) Order 2005 (or GDPO) to make the Environment Agency a Statutory Consultee on all applications for development in flood risk areas (except minor development), including those in areas with critical drainage problems and for any development on land exceeding 1 hectare outside flood risk areas. The Town and Country Planning (Flooding) (England) Direction 2007 also introduces the requirement for LPAs to notify the Secretary of State where they are minded to approve a planning application contrary to a sustained objection by the Environment Agency. PPS25 also introduces a partnership approach between Government and the Environment Agency, to extend the involvement of the Environment Agency in planning applications.

2.3 Regional Planning Policy

2.3.1 South East Plan

The core objectives of the South East Plan are to "balance continuing economic and housing growth with higher expectations and standards of environmental management and reduced levels of social exclusion and natural resource consumption." For the year 2026, the ideal is a "more sustainable pattern of development" with a "dynamic and robust economy."

The highlighted critical issue for the region is the "inadequacy of infrastructure provision to keep pace with new development. The under-investment in the region has increased the environmental impacts and had a poor affect on the economic performance of the south-east.

[4] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf
[5] Communities and Local Government. 2006. *Consultation-. Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1* December 2006. http://www.communities.gov.uk/pub/142/ConsultationPlanningPolicyStatementPlanningandClimateChangeSupplementtoPlanning1_id1505142.pdf

Development is to be centred on the existing urban areas in the region, where services can be grouped – Dover is identified as one of the 21 regional hubs where there is a plan for the provision of higher-order economic, social and cultural activities.

The sensitivity of the south east area to climate change is recognised in this plan, and is therefore a priority consideration for the Dover District SFRA.

The Dover District is identified in the South East Plan as an urban area for concentrating growth, due to the selected areas for development and the need for revitalisation of the economy. A proposal for 6,100 dwellings for the Dover district over the next 20 years (305 new dwellings per annum) is outlined in the plan, with the majority being planned for Dover itself. The growth needs to be scaled alongside increased employment opportunities.

One of the core economic strategies highlights the importance of coastal towns (Dover, Deal and Sandwich) as international gateways, and importance centres for research and manufacturing. These all need to be developed and the economy of each town diversified and enlarged to implement this strategy. Dover especially requires stronger business and community services.

2.3.2 Regional Flood Risk Appraisal (RFRA) for South East Plan

The RFRA for the South East Plan "highlights broad areas where high growth and flood risk coincide," and has been completed with close guidance from the Environment Agency.

For the purposes of identifying high growth areas that are at potential flood risk, the following indicators have been applied:

- Locations identified in sub-regional policies where there are a high number of extra homes (above 6000);
- Districts above 800 additional dwellings per annum;
- Districts above 8 additional dwellings per annum per sq km of whole district area.

The Dover District has a moderate housing provision estimate (305 new dwellings per annum) so is not highlighted within this report. However, the main outcome of the report is the need for all councils to undertake SFRAs "to assess the degree of risk and measures to mitigate and/or adapt to this."

2.3.3 River Stour Catchment Flood Management Plan (CFMP)

The River Stour CFMP is at the Draft CFMP stage, which was completed in August 2006 and is currently being finalised for completion in the coming months.

The CFMP covers an area of approximately 1,200km^2 and includes the catchment of the River Stour and the tidal area of the Lower Stour which drains the Nailbourne and Little Stour. The Dour catchment through Dover is also covered in the CFMP. The CFMP boundary encompasses the entire Dover District region including Dover, Deal and Sandwich.

The catchment is dominated by agriculture, with the majority being Grade 1 land – the best and most versatile quality. The Dour catchment is identified as a chalk dominated region, characterised by very low flows for the majority of the year and that respond slowly to rainfall.

Within the CFMP area are numerous environmentally designated sites, including an internationally designated site at Stodmarsh and a large Area of Outstanding Natural Beauty. The Rivers Stour and Dour are both recognised as important fisheries for both coarse and game fishing.

Both Sandwich and Dover are highlighted in the CFMP as key areas of potential flood risk. For Dover, 1037 properties are identified as at flood risk from a 0.5% Annual Exceedance Probability flood event (1 in 200 yr). For Sandwich, 94 properties are identified as at flood risk. A large proportion of the high quality agricultural land is at risk from flooding. In addition, the important Sites of Special Scientific Interest (SSSI) at risk from flooding are the Stodmarsh and Preston Marshes. The Stonar Cut was established in 1776 to alleviate flooding to farmland in the area just upstream of Sandwich.

Future urbanisation in the catchment is unlikely to significantly increase future flood risk on a catchment-wide scale. Climate change will cause the biggest increase on flood risk, with Sandwich and Dover identified as having the largest increases, as well as Ashford and Canterbury. Sea level rise and associated tidal flood risk are identified as major issues for future flood risk management in the catchment.

2.3.4 Dover District Local Plan

The Dover District Local Plan was adopted in 2002. Although the Plan was not developed alongside PPS25, it does recognise that development in areas at risk from flooding needs to be minimised. The low lying parts of Sandwich and Deal were cited as potential flood risk areas in the Plan. The Loop just north of Sandwich is identified as an area where development cannot impede on the protection it offers to Sandwich in terms of flood storage.

Policy WE8 in the plan states:

- "building development and land raising will not be permitted in a fluvial flood plain unless developers can demonstrate that the development will not be at risk from flooding and that it will not impede flood flows or lead to a loss of flood storage"
- "development will not be permitted in an area at risk from tidal flooding unless; it does not harm the integrity of flood defences, it does not increase the risk of flooding at the application site or elsewhere and it would not result in significant new residential development."

2.3.5 Sandwich Bay and Hacklinge Marshes Water Level Management Plan (WLMP)

The area this WLMP covers is the inland part of the Sandwich Bay and Hacklinge Marshes SSSI, on the east coast of Kent between Sandwich and Deal. The two main rivers draining this area are the North Stream and South Stream.

Severe subsidence has been noted due to the historic mining in the area, with most of the land being farmland. The two main infrastructures across the area are the Canterbury/Dover railway and the A258 road from Sandwich to Deal.

The main objectives for the region are:

- to maintain and create wet grassland for breeding/wintering waders;
- to maintain areas of fen;
- to improve water quality and biodiversity in the ditch network;
- to increase flow in the Delf Stream.

Continued monitoring of water levels and environmental assessments are planned for the area.

2.3.6 Kent and Medway Structure Plan (KMSP)

The aim of the Structure Plan is to provide a strategic planning framework that will inform decisions on development, transport and environmental issues in Kent over the next 20 years.

The Dover District falls under the East Kent region of the Structure Plan. The focus for Dover itself is economic growth and the regeneration of the town and former coalfield areas. Development proposals should capitalise on the opportunities afforded by Dover's European Gateway role. The economic prosperity of Sandwich and Deal will continue to be supported, as will their role as service centres for the East Kent coastline. These will need to be supported by transport and accessibility improvements, particularly along the A2 towards Dover. Aylesham has been highlighted due to its role as a Strategic Development Location. This area will contribute significantly to the wider housing provision for East Kent.

In summary, development in Dover should "strengthen and diversify its economy and promote environment enhancement." Included in this is the expansion and diversification of the Port of Dover and mixed use redevelopment of the Dover Town Investment Zone. The housing provisions for Dover include an additional 900 dwellings post 2011 at Dover and/or Deal, to be identified through Local Development Documents.

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3 STRATEGIC FLOOD RISK ASSESSMENT – OVERVIEW AND GUIDANCE

3.1 Background to Strategic Flood Risk Management Objectives

Historically, the management of flood risk was undertaken in a somewhat reactive manner, addressing problems on an as-needed basis in response to flooding events. It was recognised by the Government that this approach was generally not cost effective and often failed to consider individual problem areas within the wider river system.

To address this, the Environment Agency is committed to a rolling programme of flood risk mapping and strategic flood risk management investigations. These include Catchment Flood Management Plans (CFMP) and Flood Risk Management (PAG2) Strategies within fluvial systems and Shoreline Management Plans (SMP) within coastal areas.

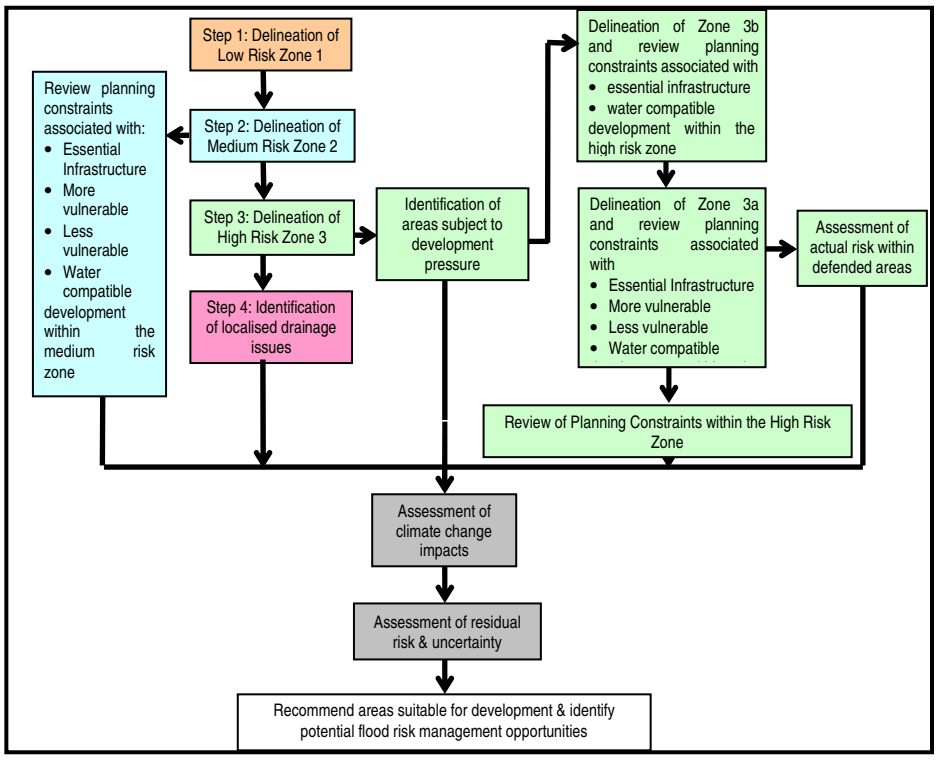
These studies take a catchment-wide approach to flood risk. They identify where flooding is known or perceived to be an existing problem and consider how flooding regimes are likely to alter as a result of climate and land use changes. The studies aim to understand the mechanism of flooding in an area and include assessments of how flooding can be cost effective and sustainably managed over the next 50 to 100 years. These investigations also pay particular attention to the environmental implications of flood risk management and seek to provide opportunities for environmental benefit wherever possible.

The importance of influencing both the strategic planning process and development control, by preventing development within flood risk areas, is recognised as a key Environment Agency objective. For this reason it is vital that the recommendations of the SFRA are consistent with the long-term strategy for flood risk management in the study areas.

3.2 Overview of the SFRA Process

The SFRA is a planning tool that can be used to inform the spatial planning process. This process is shown in Figure 3-1 and discussed in more detail below.

Figure 3-1 The SFRA Process



In line with PPS25 guidelines, it is necessary for the Environment Agency to recommend that allocations should be made outside of the flood risk areas (i.e. in Zone 1) wherever possible. If there are no reasonably appropriate Flood Zone 1 sites, allocations should be made in Zone 2 first, considering flood risk vulnerability of land uses. Only where there are no reasonably available sites in Flood Zone 1 or 2 should Zone 3 allocations be made. In order to demonstrate that there are no lower risk sites available the Sequential Test needs to be carried out.

The information provided in the SFRA should allow the LPAs to carry out the Sequential Test.

Only on completion of the Sequential Test should the Exception Test be used to justify allocations or developments in high risk areas where the need to develop is considered exceptional. Whilst the SFRA has been undertaken in partnership with the Environment Agency, it is likely they will object to some of the potential allocation sites. They may maintain objections to these on site specific flood risk grounds unless sufficient information can be provided to show the risks can be safely mitigated in the design. This is a matter of detail that cannot be addressed in a strategic assessment.

An SFRA is a project with defined start and end points. The deliverables are a report and suite of maps to allow the sequential testing to take place within the LDF. The SFRA itself cannot determine where additional replacement sites in low-risk areas can be found.

The LPAs have the information and options to sequentially test and provide more detailed evidence to support the Exception Test within this SFRA. The SFRA will recommend removal of allocations at the extreme of flood risk policy, e.g. sites in the functional floodplain or rapid inundation zone.

The SFRA provides some indication of deliverability, and hence whether the site should be considered in more detail.

At its highest level the SFRA assesses the spatial flood probability across the study areas allowing the Sequential Test to be undertaken. Within defended floodplains where individual allocations have the potential to alter the risks significantly, leading to significant residual risks, the Sequential Test requires a more detailed assessment of probability and consequences. Floodplains provide storage and attenuation for the river system. Any major changes to the floodplain must, therefore, also consider the impact to the river system as a whole.

The assessment of flood risk within the study areas should be targeted where development is proposed within current planning horizons. Furthermore, the confidence placed in the SFRA, with respect to the delineation of flood risk, should be sufficient so that it may be used to inform the future allocation of sites within the Local Development Framework.

Risk is defined as a function of both probability of an event occurring and the consequence should that event take place. When considering the actual risk associated with the failure of a flood defence, consideration must be given to both overtopping and the structural integrity of the defence. In terms of both economic viability and practicality, the consequence of defence failure is largely a function of the intended land use. For example, the vulnerability of residential areas to flooding is considered greater than flooding to industrial or commercial developments. Similarly, the risk to a residential home is considered greater than the risk to a renovated mill where the ground floor level is not likely to be used for residential accommodation. PPS25 discusses residual risk arising from flood defences and that 'development should not be normally be permitted where flood defences, properly maintained and in combination with agreed warning and evacuation arrangements, would not provide an acceptable standard of safety taking into account climate change'. Therefore even in heavily defended floodplain, with say a 1% standard of protection, an assessment is required of the residual risks and that these remain acceptable over the lifetime of the development.

To assess actual risk, it may be necessary to model the consequence of overtopping sea defences in a 0.5% probability event. Generally, the worst case scenario will coincide with a failure of the defences at the peak of the flood event. To this end, a two dimensional inundation model (which has the ability to predict depth and velocity) of the defended area may be required to examine the impact of either a breach failure or overtopping during the design event. The extent of inundation behind the defence should be identified, and the depth and velocity of flow (within the inundated area) monitored over time throughout the duration of the event. Results will be provided based on the worst case scenario for each site.

3.3 Sequential Flood Risk Test (SFRT) – PPS25

PPS25 provides the basis for the sequential approach, it recommends that LPAs use a risk based approach to development planning and specifies the need, for undertaking RFRAs and SFRAs in Annex E.

When allocating or approving land for development in flood risk areas, those responsible for making development decisions are expected to demonstrate that there are no suitable alternative development sites located in lower flood risk areas.

The methodology introduces a Sequential Flood Risk Test (SFRT) that is core to the SFRA process. The SFRT is the key driver for the SFRA. The Environment Agency Flood Zone Map will provide the basis of the test, which will be undertaken a number of times, considering a greater resolution and understanding of flood risk at each stage taking into account flooding from other sources. At each step, sites of lower flood risk are identified and prioritised in order of vulnerability to flood risk and their safety in terms of allocation for development.

A further level of analysis may be required where development is planned behind or adjacent to existing defences in order to test the sustainability and robustness of the mitigation measures.

This SFRA provides the Council with flood zone classifications for all present locations identified for development as well as the information required to classify future allocations. The information provided by the SFRA will assist the Council in developing their LDFs and prioritise allocations.

The Council will be required to prioritise the allocation of land for development in ascending order from Flood Risk Zone 1 to 3, including the subdivisions of Flood Risk Zone 3, if necessary. The Environment Agency has statutory responsibility and must be consulted on all development applications allocated with medium and high risk zones, including those in areas with critical drainage problems and for any development on land exceeding 1 hectare outside flood risk areas. In these circumstances, the Environment Agency will require the Council to demonstrate that there are no reasonable alternatives, in lower flood risk categories, available for development. Where appropriate, the Exception Test is to be applied.

3.4 The Exception Test

Where departures from the Sequential Test are justified by the need to locate development in higher risk zones than is appropriate, in order to meet the wider aims of sustainable development, it is necessary to apply the Exception Test. PPS25 acknowledges that flood risk is one of many issues (including transport, housing, economic growth, natural resources, regeneration and the management of other hazards) which need to be considered in spatial planning.

The Exception Test is “only appropriate for use when there are large areas in Flood Zones 2 and 3, where the Sequential Test alone cannot deliver acceptable sites, but where some continuing development is necessary for wider sustainable development reasons, taking into account the need to avoid social or economic blight and the need for essential infrastructure to remain operational during floods.” It may also be appropriate to use it where restrictive national designations such as landscape, heritage and nature conservation designations, e.g. Areas of Outstanding Natural Beauty (AONBs), Sites of Special Scientific Interest (SSSIs) and World Heritage Sites (WHS), prevent the availability of unconstrained sites in lower risk areas.

PPS25 explains where and for what type of development the Exception Test needs to be applied. In some situations, for certain types of development, it is not appropriate to use the Exception Test to justify development, for example, development which is highly vulnerable to flooding cannot be justified within the high risk zone through the use of the Exception Test. The situations where it is necessary and appropriate to apply the Exception Test are outlined below.

Where the Exception Test is required, it should be applied as soon as possible to all Local Development Document (LDD) allocations for development and all planning applications other than for minor development[6]. The Exception Test is only carried out upon passing of the Sequential

[6] Definition of minor development:

-Minor non-residential extensions: Industrial/Commercial/Leisure etc. extensions with a footprint less than 250m^2

-Alterations: development that does not increase the size of buildings e.g. alterations to external appearance.

Test. All three elements of the Exception Test have to be passed before development is allocated or permitted. For the Exception Test to be passed:

a. *It must be demonstrated that the development provides wider sustainability benefits to the local community that outweigh flood risk, informed by an SFRA, where one has been prepared. If the Development Plan Document (DPD) has reached the 'submission' stage – see Figure 4 of PPS12: Local Development Frameworks – the benefits of the development should contribute to the Core Strategy's Sustainability appraisal.*

b. *The development should be on developable previously developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable, previously developed land; and*

c. *A Flood Risk Assessment must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.*

PPS25 (paragraphs D11 and D12) states that the Exception Test "should be applied to LDD site allocations for development and used to draft criteria-based policies against which to consider planning applications…Where the Exception Test has been applied in LDD allocations or in criteria-based policies, the local planning authority should include policies in its LDDs to ensure that the developer's FRA satisfies criterion C). The Environment Agency and other appropriate operating authorities such as Internal Drainage Boards should be consulted on the drafting of any policy intended to apply the Exception Test at a local level".

Compliance "with each part of the Exception Test should be demonstrated in an open and transparent way".

Table 3-2 summarises the applicability of the exception test for different development sites; housing allocations are classified as 'more vulnerable' and employment allocations are 'less vulnerable' (see Table 3-1)

3.5 Flood Risk Vulnerability Classification

In PPS25 different types of development are divided into five flood risk vulnerability classifications:

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development.

Subject to the application of the Sequential Test, PPS25 specifies which of these types of development are suitable within each zone:

Zone 1: All the uses of land listed above are appropriate in this zone.

Zone 2: The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure are appropriate in this Zone. The highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.

Zone 3a: The water-compatible and less vulnerable uses of land are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed.

Zone 3b: Only the water-compatible uses and the essential infrastructure that has to be there should be permitted in this zone. Essential infrastructure in this zone should pass the Exception Test and be designed and constructed to meet a number of flood risk related targets. The less vulnerable, more vulnerable and highly vulnerable uses should not be permitted in this zone.

-'Householder' development: e.g. sheds, garages, games rooms etc. within the curtilage of the existing dwelling in addition to physical extensions to the existing dwelling itself. This definition EXCLUDES any proposed development that would create a separate dwelling within the cartilage of the existing dwelling e.g. subdivision of houses into flats.

Table 3-1 Flood Risk Vulnerability Classification

Essential Infrastructure	• Essential transport infrastructure and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.
Highly Vulnerable	• Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations and emergency dispersal points. • Basement dwellings, caravans, mobile homes and park homes intended for permanent residential use. • Installations requiring hazardous substances consent.
More Vulnerable	• Hospitals, residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwellings, student halls of residence, drinking establishments, nightclubs, hotels and sites used for holiday or short-let caravans and camping. • Non–residential uses for health services, nurseries and education. • Landfill and waste management facilities for hazardous waste.
Less Vulnerable	• Buildings used for shops, financial, professional and other services, restaurants and cafes, offices, industry, storage and distribution, and assembly and leisure. • Land and buildings used for agriculture and forestry. • Waste treatment (except landfill and hazardous waste facilities), minerals working and processing (except for sand and gravel). • Water treatment plants and sewage treatment plants (if adequate pollution control measures are in place).
Water-compatible Development	• Flood control infrastructure, water transmission infrastructure and pumping stations. • Sewage transmission infrastructure and pumping stations. • Sand and gravel workings. • Docks, marinas and wharves, navigation facilities. • MOD defence installations. • Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location. • Water-based recreation (excluding sleeping accommodation). • Lifeguard and coastguard stations. • Amenity open space, nature conservation and biodiversity, outdoor sports and recreation. • Essential sleeping or residential accommodation for staff required by uses in this category, subject to a warning and evacuation plan.

Notes:

1) *This classification is based partly on DEFRA/Environment Agency research on Flood Risks to People (FD2321/TR2) and also on the need of some uses to keep functioning during flooding.*
2) *Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.*
3) *The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.*

Source: PPS25 Table D2

Table 3-2 Flood Risk Vulnerability and Flood Zone Compatibility

Vulnerability classification (Table 3-2)		Essential Infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less Vulnerable
Flood Zone (Table 3-1)	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception test	✔	✔
	Zone 3a	Exception test	✔	x	Exception test	✔
	Zone 3b	Exception test	✔	x	x	x

Key:
✔ Development is appropriate
x Development should not be permitted

Source: PPS25 Table D3

3.6 Specific Guidance

The guidance detailed below has been developed to provide a clear, concise and consistent means of assessing the feasibility and sustainability of sites and to determine appropriate flood risk mitigation measures where required. The framework will aid Dover District Council and others in assessing flood risk associated with allocations and potential development sites. It will also allow policies on flood risk to be included in the LDDs, which draw upon national guidance for consistency, but provide the local detail and interpretation of these national policies.

PPS25 aims to direct development to lower flood risk sites wherever possible. "*The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid* ***inappropriate*** *development in areas at risk of flooding, and to direct development away from areas at higher risk.*" (paragraph 5). Only when the Sequential Test has been employed and new development is, **exceptionally**, necessary and no other lower risk sites have been shown to be available should the Exception Test be applied.

The guidance focuses on the technicalities of flood risk management rather than the other planning issues an LPA must consider in selecting allocations. It should, therefore, be assumed that:

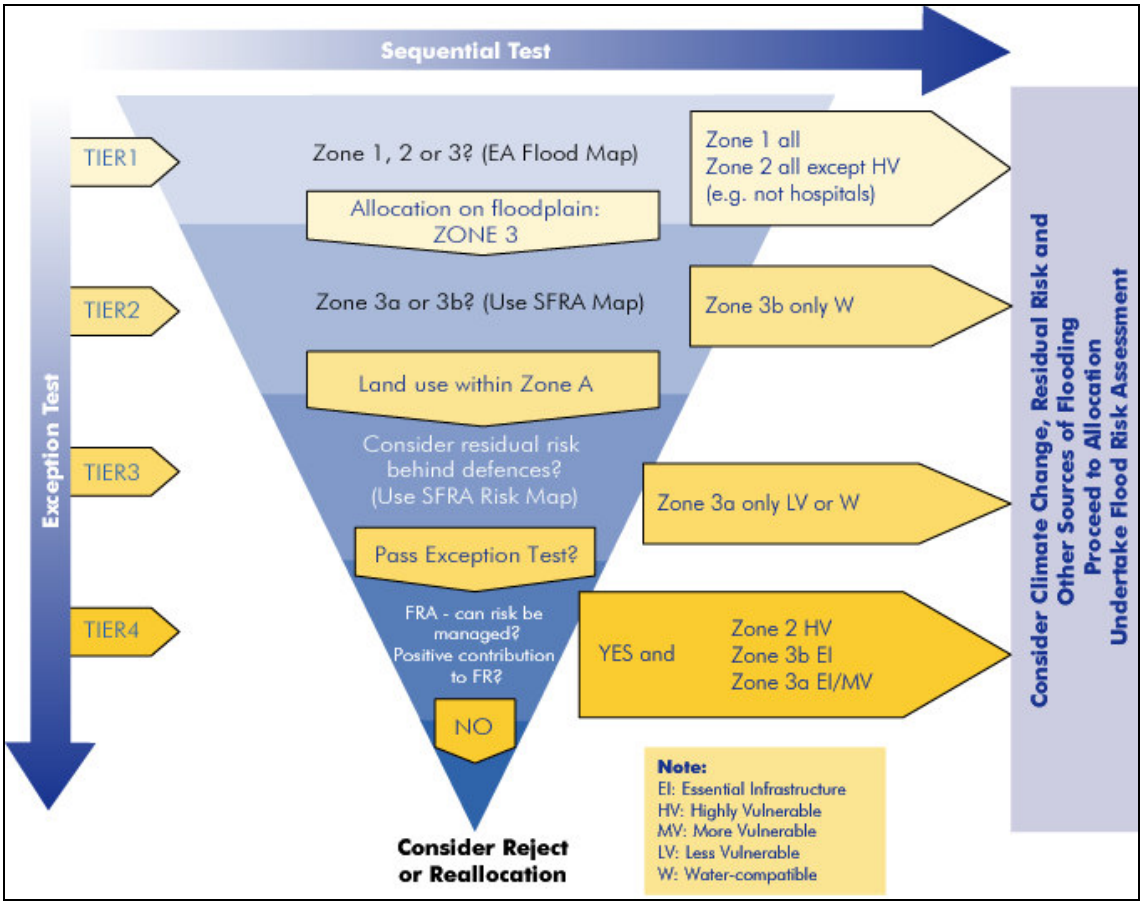
- These other planning issues have been considered separately;
- For land to be allocated within the high risk zone, the full range of planning issues has been evaluated.

It should also have been determined through the SEA (Strategic Environmental Assessment) and SA (Strategic Assessment) that the land is the most suitable for development.

It must be made clear that this SFRA does not preclude the need for site specific Flood Risk Assessments. Figure 3-2 highlights the type of development considered appropriate for each Flood Zone; the development not permitted; the development allowed only if the Exception Test is passed; and whether a site specific Flood Risk Assessment is required.

This chapter will present the guidance for Flood Zone 3 (including defended and undefended areas, public safety and Rapid Inundation Zones, and the feasibility of flood risk mitigation); Flood Zone 2; and Flood Zone 1. It will then discuss issues relating to other known flood risk areas.

Figure 3-2 The Sequential Test: its practical application



3.7 Flood Zone 3a – High Probability

PPS25 states that the water-compatible uses and less vulnerable development are allowed in this Flood Zone, following testing within the sequential process. According to PPS25 highly vulnerable development is not permitted. Essential infrastructure and more vulnerable development need to pass the Exception Test, while essential infrastructure should be designed and constructed to remain operational and safe for users in times of flood.

According to PPS25, developers and local authorities should address the following policy aims:

- Reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- Relocate existing development to land in zones with a lower probability of flooding; and
- Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage[7]

Therefore a presumption for further development in existing floodplains is not supported by PPS25, and any future SFRA should review existing areas to see if relocation is a spatially sustainable strategy. The delineation of the subset zones of High Risk Zone 3 may be sufficient to allow the spatial planning process to continue, with development steered away from these high risk zones.

Regeneration of land or change in land use behind existing defended areas in the High Risk Zone will continue to require a more detailed assessment of the flood risk (i.e. whether the scale of risk is worth taking, and how sustainable and effective the mitigation measures would be [i.e. whether the

[7] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 24 http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

risk could be managed]). Where, due to wider sustainable development reasons, there are no other suitable sites available in lower risk zones then an assessment of the actual risk within Flood Zone 3 is required. Annex G in PPS25 deals with managing residual flood risk.

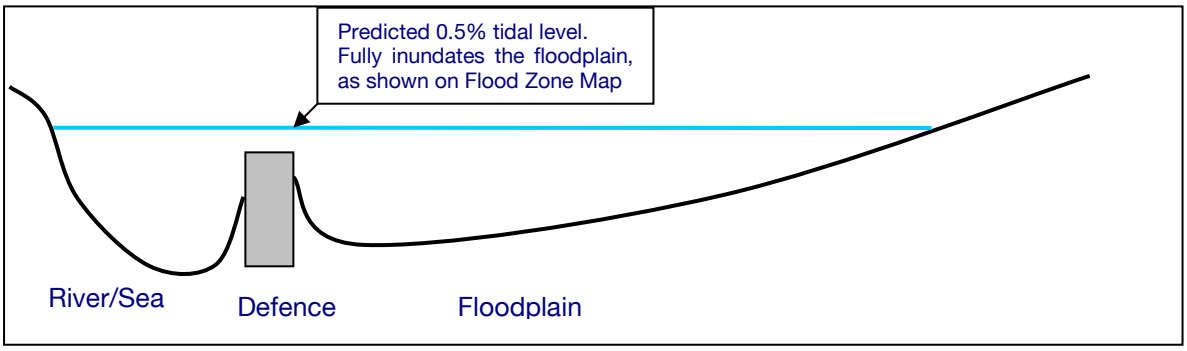
Paragraph G2 of PPS25 states that following application of the Sequential Test and Exception Test for development in Zone 3a a clear examination of the residual risks should be made and development:

*"Should **not** normally be permitted where flood defences, properly maintained and in combination with agreed warming and evacuation arrangements, would not provide an acceptable standard of **safety** taking into account climate change."*

It would be up to the developer to demonstrate how, in planning terms, this safety can be achieved and how the residual risks will be managed. A clear distinction between commercial flood standards of protection and management of loss of life should be explored in the FRA. A greater reliance on flood warning may be required, which is not always a tangible alternative to accepting a lower standard of protection.

In the context of this discussion an **undefended area** (Figure 3-3) of coastal plain is considered to be an area where the water level for the 0.5% event will be similar to that of the sea. These areas may be entirely undefended or if defences are present they are discontinuous or constructed to a low standard. In these areas guidance provided in Section 5.3.1 (undefended areas) will be most relevant in assessing sustainability and determining mitigation requirements.

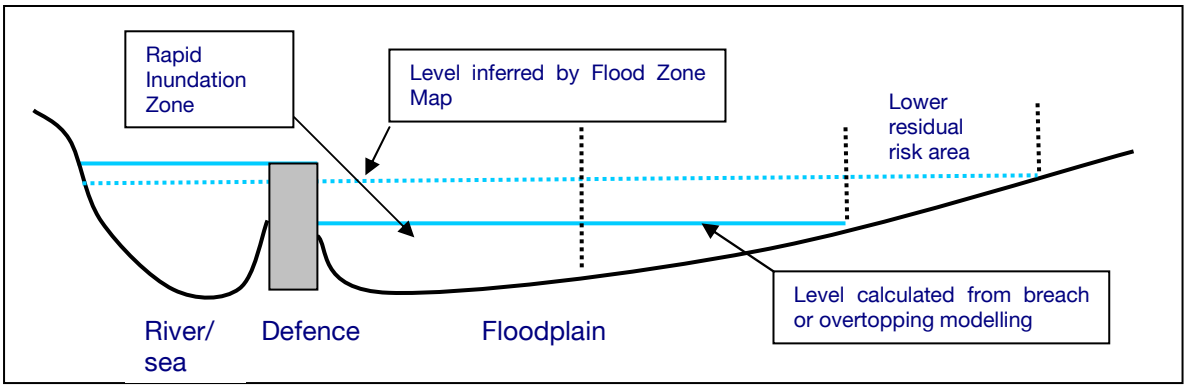
Figure 3-3 Illustration of the undefended area case, where the standard of protection is low and floodplain is small and fills to the same level as the sea or river



A **defended area** (Figure 3-4) is considered to be an area along the coastal plain where the defences will result in a water level for the 0.5% event that is considerably lower than the source (the sea). This means the defences substantially (but not necessarily completely) mitigate the flood risk associated with the 0.5% event. These areas will be defended to a minimum standard promoted by Defra, but not always necessarily to the 200 year tidal standard. In these areas guidance provided in Section 5.3.2 (defended areas) will be most relevant in assessing sustainability and determining mitigation requirements.

Areas Benefiting from Defences is the next generation of information to be provided by the Environment Agency on their Flood Map. For the purposes of future application of this guidance the standard of protection provided by the Environment Agency or from an assessment from an existing or new model would suffice. Areas which are defended will be protected by recent flood management schemes and are therefore well known to Environment Agency staff.

Figure 3-4 Illustration of the defended area, where the overtopping or breach volume is small compared to the floodplain receptor and allows a refined assessment of residual risk



3.7.1 Undefended Areas – Flood Risk Mitigation

Within undefended or poorly defended Zone 3a areas, floor levels for housing developments should, as a minimum, be situated above the acceptable standard of safety with sufficient freeboard to account for uncertainties in flood level prediction and climate change.

The following paragraphs define an appropriate standard of flood risk mitigation in undefended areas in the context of this SFRA.

The Sequential Test should be applied within the development site area, and it is considered appropriate to direct more vulnerable land uses to parts of the site at less probability and higher residual risk of flooding. The lower floors of buildings in areas at both medium and high probability of flooding should seek to develop water-compatible and less vulnerable land uses, including car parks or other public areas.

Housing developments (more vulnerable development) should provide a minimum habitable space floor level above the estimated 0.5% year tidal (1% for fluvial flooding) water level with the addition of allowances for modelling uncertainty and climate change (i.e. freeboard). This may be achieved by providing car parking or other public areas at ground floor level

Employment development (less vulnerable development) should provide a similar standard of flood defence as housing developments. Within undefended or poorly defended Zone 3a areas, employment development should remain dry during the 0.5% tidal event (or breach scenario where defences are in poor condition) or 1% fluvial event, with sufficient freeboard to account for uncertainties in flood level prediction and climate change. Developers will need to carefully consider the commercial viability of developing in these areas. In exceptional circumstances, where there is significant planning justification for development and the provision of this standard of defence is not feasible, a greater acceptance of flood risk may be permitted for less vulnerable development in areas of high probability of flooding with the focus on providing safety to occupants, flood proofing and designing buildings to minimise flood damage.

Flood resilient construction may be considered in circumstances where there is a low probability of limited shallow depth water entry and buildings are not subjected to severe inundation depths. This type of construction is designed to reduce the consequences of flooding and facilitate recovery from the effect sooner than conventional buildings.

This may be achieved 'through the use of water-resistant materials for floors, walls and fixtures and the sitting of electrical controls, cables and appliances at a higher than normal level'[8] and flood resistant construction to either reduce the amount of water or prevent entry of water into a building where resistant techniques are used. A means of safe access and egress in times of flooding must be provided, especially when considering those with restricted mobility.

[8] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 38 http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

Whilst the basic level of protection afforded to residential and commercial development is the same, it is clear that approaches to how residual risk is managed may differ between these two types of developments. For residential development residual risk is a societal issue, for which a presumption of avoidance and removal is appropriate. Hence a significant freeboard should be incorporated into housing development floor levels, whereas for a commercial property the end user and insurer can assess and transfer this residual risk as appropriate. Therefore commercial and employment uses have a suitably different approach to the management of the residual risk, above that provided by the basic mitigation works. The onus would be on the local authorities to determine whether these risks are acceptable, in conjunction with advice from the Environment Agency. PPS25 advocates a risk based approach linked to vulnerability, and does not provide a prescriptive set of flood protection standards. Wherever possible as high a standard should be provided, but in exceptional circumstances, where alternative or complementary flood risk management measures can be taken and are sustainable, a lower standard may be acceptable. Care must be taken that such an approach would not result in future public expenditure on retrospective flood alleviation measures. Therefore this approach is exceptional and only applicable in limited locations where the flood risks are fully understood.

Isolated small Greenfield developments may be sustainable in terms of their impact on floodplain storage and conveyance, however the cumulative effects of many small developments can be large and Greenfield sites must be viewed within a wider perspective.

The feasibility of mitigation measures may be assessed in accordance with the guidance established in 5.7.

3.7.2 Defended Areas – Flood Risk Mitigation

Within defended areas flood risk is primarily associated with overtopping and/or breach of defences (and localised flooding associated with drainage systems in some locations). These risks are related to the likelihood (standard of protection and structural integrity of defences) and consequences of flooding (depth, speed and duration of flooding, and land use within defended area).

The likelihood of overtopping can be estimated by comparison of modelled water levels (where available) and defence crest levels. An indication of the likelihood of defence breach can be gained by reviewing the flood defence condition data held within the National Flood and Coastal Defence Database (NFCDD) and more detailed surveys and investigations undertaken by the Environment Agency and/or others. The consequences of defence overtopping or breach failure can be estimated using flood inundation modelling and mapping.

For developments to proceed it must also be shown that the development will not increase flood risk elsewhere through a loss of breach storage or conveyance. Flood risk must be reduced or kept at current levels as contained in the Regional Spatial Strategy (RSS) policy statement.

The feasibility of mitigation measures may be assessed in accordance with the guidance established in 5.7.

Overtopping

Areas where the standard of protection is less than 0.5% for tidal defences (1% for fluvial defences) are defined as undefended, by this SFRA. Where assessments show an area to be at risk of sea defence overtopping in the 0.5% event (with climate change), measures should be employed to mitigate the risk. Where floor level raising is the preferred mitigation technique, minimum floor levels for housing developments should be set above the estimated water level that would result behind the defences (with an allowance for uncertainty and climate change). In exceptional circumstances, where there is significant planning justification for development and the provision of this standard of risk mitigation is not feasible, a lower degree of flood risk mitigation may be permitted in employment developments with the focus on providing safety to occupants, flood proofing and designing buildings to minimise flood damage.

Where the defences consist of earth embankments, overtopping of the defences is likely to lead to erosion and weakening of the defence structure. In these circumstances failure of the defences is considered highly probable and an assessment of the consequences of defence breach is also required.

Breach

Where the defences are shown to be at risk of overtopping (as above) and/or NFCDD data or additional information indicate that the flood defences are in poor or very poor condition, for the purposes of the SFRA it is assumed that there is a reasonable likelihood of defence breach in a major flood event. A high degree of flood risk mitigation needs to be provided therefore, or it may be that the high risk renders the location as being unsuitable for development. If mitigation measures are acceptable, then minimum floor levels in housing developments should be set above the estimated maximum breach water level for the 0.5% tidal event (or 1% fluvial event) with allowance for climate change and other uncertainties (e.g. wave overtopping levels).

In locations where the defence is of a high standard, both in terms of stability and height, then the probability of a breach occurring is reduced and hence the risk reduces as well. The overall probability of the consequences associated with a breach occurring extend to the extreme end of the risk continuum. This allows a more considered approach to residual risk, and some flooding of non-sensitive or vulnerable developments may be considered acceptable.

The effects of land raising within defended areas on potential breach risk also warrants careful consideration in the flood risk assessment. In confined floodplains where breach levels approach those in the sea or river, land raising is unlikely to have any impact on breach water levels and extents. However, where the floodplain is not confined by natural high ground or secondary defences, or where the passage of breach floodwater is restricted by partial barriers such as road or rail embankments, and consequently breach levels do not approach the sea or river water level, then there is potential for land raising to lead to an increase in flood risk (extent and depth of breach) elsewhere. The potential for increasing breach related flood risk elsewhere is directly related to the loss of breach storage volume and conveyance, and single, small-scale developments are unlikely to have a significant impact. However, the cumulative effect of individual development proposals needs to be considered. Quantitative assessment of these effects may require detailed breach modelling to be undertaken in individual flood risk assessments. This guidance is not restricted to Zone 3a and applies to any site that is located within a defended area that is at risk of flooding from defence failure.

3.7.3 Public Safety

For all Zone 3a allocations, and particularly in defended areas where a development site is close to a defence, consideration must be given to residual risks and the risk to public safety associated with access and egress from properties. Residual risks are those associated with very low likelihood events, such as events of frequency less than 0.5% Annual Exceedance Probability tidal event (or 1% AEP fluvial event) and failure of defences where defences provide a high standard of protection.

Development should not be sited where these risks unduly threaten public safety and/or the structural integrity of buildings and infrastructure. Consideration of the depth of flooding, flow velocity, rate of inundation and safe access / egress is required to assess these risks. This assessment is applicable to areas at risk from both breach and overtopping.

There is a range of research and guidance available on flood hazards and public safety. DEFRA/Environment Agency Flood and Coastal Flood Defence Research and Development Programme, Project FD2321/TR2 (2006), Flood Risks to People consolidates flood hazard research from many sources.

3.8 Flood Zone 3b – The Functional Floodplain

PPS25 states that only the water-compatible uses are allowed in Flood Zone 3b. Essential Infrastructure can be permitted after the Exceptions Test is passed. According to PPS25, developers and local authorities should aim to:

- Reduce overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and

- Relocate existing development to land with a lower probability of flooding[9]

In addition, according to PPS25, essential infrastructure should:

- Remain operational and safe for users in times of flood;
- Result in no net loss of floodplain storage;
- Not impede water flows
- Not increase flood risk elsewhere[10].

Essential infrastructure needs to pass the Exception Test. This SFRA will indicate whether part c. of the Exception Test is likely to be met. Part c. of the Exception Test is as follows:

> c) A Flood Risk Assessment must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

3.9 Flood Zone 2 – Medium Probability

Zone 2 is considered suitable for water-compatible, less vulnerable, more vulnerable and essential infrastructure. Highly vulnerable development is only allowed where the Exception Test is passed.

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

For highly vulnerable development in Flood Zone 2, this SFRA will also indicate whether part c. of the Exception Test is most likely to be met.

Where development is implemented, floor levels should be situated, as a minimum, above the 0.5% peak tidal (1% fluvial) flood level with sufficient freeboard to account for inherent uncertainties with respect to flood level prediction and potential climate change scenarios. A site based Flood Risk Assessment should be undertaken at the planning application stage to facilitate the delineation and definition of the 0.5% tidal flood event (1% fluvial flood event) envelope.

3.10 Flood Zone 1 – Low Probability

In accordance with PPS25, all development (essential infrastructure, highly vulnerable, more vulnerable, less vulnerable and water-compatible development) is allowed in Flood Zone 1.

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA.

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

In situations where a known flooding problem has been identified downstream, controls will be required to ensure that the proposed development does not result in a worsening of existing flooding conditions.

3.11 Other Known Flood Risk Areas

In certain locations an increase in the rate of runoff and/or volume from a new development situated upstream of an area that is known to be susceptible to localised flooding (e.g. as a result of

[9] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 24 http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

[10] Communities and Local Government. 2006. *Planning Policy Statement 25: Development and Flood Risk*. December 2006. pg 24
http://www.communities.gov.uk/pub/955/PlanningPolicyStatement25DevelopmentandFloodRisk_id1504955.pdf

problematic surface water drainage or local watercourse or hillside flooding) may exacerbate the degree of flood risk to that downstream area.

Such areas will be sensitive to the drainage system implemented with that particular development site, as the drainage system will determine site runoff rates and volumes.

These areas have been termed Drainage Sensitive Areas and include sites situated upstream of an area that is known to be susceptible to localised flooding.

Known problematic areas have been identified using information provided by the Council and the Environment Agency, which can be found in allocation tables for those sites located in Flood Zones 2 and 3.

The capacity of internal drainage infrastructure is often limited and is at or near capacity under existing conditions. Development that leads to increased peak runoff within the drainage catchments may lead to infrastructure capacity being exceeded, with the potential for increased flood risk. A detailed FRA would be expected regardless of which Flood Zone applies.

New developments upstream of these areas must be managed effectively to ensure that the impact upon downstream properties is fully mitigated. Wherever possible, this should be achieved through the implementation of a sustainable drainage or flow retention system, constructed within the boundaries of the development site.

Ideally the local planning authority should work closely with the Environment Agency, sewerage undertakers and developers to enable surface-water runoff to be controlled as near to the source as possible. For Greenfield developments, the aim is to not increase runoff from the undeveloped situation and for Brownfield re-developments, to reduce existing runoff rates. Wherever possible, this should be achieved through the implementation of a sustainable drainage or flow retention system, constructed within the boundaries of the development site.

A Flood Risk Assessment will be required in each instance to design appropriate mitigation measures and demonstrate that the development will not adversely affect existing flooding conditions. The FRA should define and address the constraints that will govern the design of the drainage system.

The effectiveness of a flow management scheme within a single site is heavily limited by site constraints including (but not limited to) topography, geology (soil permeability), and available area. The design, construction and ongoing maintenance regime of such a scheme must be carefully defined, and a clear and comprehensive understanding of the catchment hydrological processes (i.e. nature and capacity of the existing drainage system) is essential. In these areas a Flood Risk Assessment will be required that demonstrates that the proposed development will not adversely affect existing flooding conditions either alone or in combination with other development.

At the planning application stage, discussions should be held with the Environment Agency, Dover District Council and Southern Water to ascertain the specific nature and most appropriate means of managing the flood risk.

The integration of drainage management is highlighted within the DEFRA strategy for flood and coastal erosion risk management in England, detailed within the consultation document 'Making space for Water'[11]. The strategy aims to achieve better overall management of surface water drainage through better co-ordination between the different bodies.

[11] Defra. 2004. *Making Space for Water; Developing a new Government strategy for flood and coastal erosion risk management in England, A consultation exercise.*

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4 METHODOLOGY AND DATA SOURCES

4.1 Methodology of Strategic Flood Risk Assessment

4.1.1 Data collection

A critical phase in the project delivery is the collection and review of existing information. These data comprise known or perceived flood risk issues within the district, development pressures and constraints and current policy governing development within flood risk affected areas. The majority of this data have been recorded and included in the GIS data layers used to undertake this assessment.

Table 4-1 Data availability for use in Dover District SFRA

Data Type	Use within SFRA
OS 10k Basemap	Flood Risk Mapping
Flood Zones 2 and 3	Initial Flood Zone delineation
Main River map	Flood Risk Mapping
Historic flood map	Flood Risk areas
NFCDD	Locate defended and undefended sites
Photogrammetry	Flood Risk Mapping
Proposed Development Areas – GIS layer	Flood Risk Mapping
LiDAR (Dover)	Flood Risk Mapping
Dour hydrology report	Flood Risk Mapping
Lower Stour 2D modelling (Great Stour Flood Risk Mapping – PBA, 2003)	Flood Risk Mapping
Lower Stour Flood Study (PBA, 2001)	Flood Risk Mapping and flood defence infrastructure
Sandwich Bay and Hacklinge Marshes Water Level Management Plan (EA, 2006)	Background information
Stour Catchment Flood Management Plan – Draft Main Stage (EA, 2007)	Background information, flood risk areas, historic flood information
Extreme Sea Levels – Kent, Hampshire, Sussex and the Isle of Wight (EA, 2004)	Flood Risk Mapping
Regional Flood Risk Appraisal for South East Plan (Regional Assembly, November 2006)	Background information, flood risk areas

4.1.2 Assessment of flood risk

The primary objective is to assess and categorise, in accordance with Table D.1 of PPS25, flood risk within the development areas. In general, the following considerations have been addressed as part of the flood risk assessment process:

- Definition of areas subject to development and regeneration pressures;
- Identification of known or perceived flood risk areas, including the nature of the flooding problem (e.g. river flooding, local under-capacity drainage, culvert blockage) providing the initial 'filter' for key flood risk issue areas within the SFRA area;
- Review of the current Environment Agency Flood Zone Maps, to provide the broad (first pass) definition of high risk Flood Zone 3;

- Review of more detailed flood risk information from model results where available, to refine the delineation of actual risk in Flood Zones;
- Identification of washland and critical floodplain areas as high risk Flood Zone 3b;
- Identification of formal and informal flood defences that reduce flooding to development; and
- Identification of potential development areas known to flood to ensure impact upon upstream and downstream properties is adequately considered.

4.1.3 Delineation of flood zones

To provide the information necessary, an assessment of both tidal and fluvial flood risk has been made. For flood risk to the Dover District, the following methodology has been used:

Sandwich and Deal

The following extreme sea level projections[12] have been used to map potential tidal flood risk areas for Sandwich, Deal and Kingsdown:

- 4.7m AOD (current 200yr [0.5% Annual Exceedance Probability] flood event);
- 5.2m AOD (current 1000yr [0.1% AEP] flood event);
- 5.64m AOD (projected 200yr flood event plus climate change until the year 2100);
- 6.14m AOD (projected 1000yr flood event plus climate change until the year 2100).

Tidal flood risk outweighs the potential fluvial flood risk from the River Stour through Sandwich so is considered to be the worst case scenario.

All of these projections do not consider the presence of any flood defence infrastructure along the coast, hence these show *potential* tidal flood risk not *actual* flood risk. Actual flood risk has also been assessed and is discussed in section 4.2.

For the River Wingham, mapped flood outlines from the Peter Brett Study[13] have been utilised to assess the fluvial flood risk for this region.

Dover

To assess the flood risk in Dover, a combination of both tidal flood risk projections and fluvial flood risk from the River Dour has been used. To assess the fluvial flood risk, an existing model for the River Dour (developed by Peter Brett Associates for the River Stour Catchment Flood Management Plan, and using hydrology from the River Dour hydrology report[14]) has been utilised to map the potential flood risk areas for; the 1 in 100yr (1% AEP) flood event; 1 in 100yr plus climate change flood event; the 1 in 1000yr (0.1% AEP) flood event and the 1 in 1000yr plus climate change flood event. Climate change allowances have been based on the latest DEFRA guidance (Table B2 of PPS25), meaning a 20% increase in peak river flows has been added to current flows. The River Dour model developed for this study is broadscale in that it was developed to meet the objectives of this strategic level study only. In light of this, it is not recommended that the model in its current state be used to provide accurate water levels for development control purposes.

To assess the tidal flood risk in Dover, the following extreme sea level projections have been used to map the potential tidal flood risk area:

- 4.87m AOD (current 200yr [0.5% AEP] flood event);
- 5.22m AOD (current 1000yr [0.1% AEP] flood event;
- 5.78m AOD (projected 200yr flood event plus climate change until the year 2100);
- 6.31m AOD (projected 1000yr flood event plus climate change until the year 2100).

[12] Current and projected sea levels have been taken from the Environment Agency report on Extreme Sea levels in Kent, Sussex, Hampshire and the Isle of Wight – December 2004. Climate change allowances have been based on the latest DEFRA guidance (Table B1 in PPS25).

[13] River Great Stour Flood Risk Mapping – Great Stour Report (Peter Brett Associates – November 2003).

[14] River Dour Hydrology Final Report (Peter Brett Associates – March 2007).

Functional floodplains

In this SFRA Functional Floodplains have been assessed using a qualitative approach for the 1 in 20 annual probability flood event as a baseline of the floodplain extent. However, as the coastline is defended, the functional floodplain has only been examined for the River Dour and River Stour. Functional floodplains have been discussed with Development Control of the Environment Agency and are considered to be secondary to Rapid Inundation Zones, as such, only several areas throughout the district are within Flood Zone 3b. These areas are highlighted in Chapter 5.

4.2 Breach and Overtopping

4.2.1 Detailed Assessment – Areas at risk from overtopping or breaching of flood defences

For areas where overtopping or breaching of flood defence infrastructure is likely to occur and will have significant implications for proposed development sites, it may be necessary to assess the consequences of these scenarios in greater detail. This will provide information on the likely depths and velocities to be expected for each location if one of these scenarios occurred, and the time it would take for the site to flood. It will also allow the identification of Rapid Inundation Zones (the areas at greatest risk of flooding from these scenarios). These Rapid Inundation Zones (which are often located immediately behind flood defences) are high risk zones, in which PPS25 recommends development should be avoided wherever possible.

Locations for breaches and overtopping of coastal and fluvial defences were selected based on:

- National Fluvial and Coastal Defence Database (NFCDD) – defence crest levels, the Standard of Protection (SoP) and condition of defences;
- Availability of topographical data;
- Highest risk development areas – places of lower lying land or where they are located close to a flood defence;
- Consultation and advice obtained from the Environment Agency.

To model the breach and overtopping scenarios, JBA's 2-dimensional raster floodplain model called JFLOW was used. This routes floodwater across the floodplain using specified inflow points. It uses the Photogrammetry data as the floodplain to route water across and produces depths, indicative velocities and time to inundation based on the selected return period flood event.

Using this information, the following guidelines were used to model breach and overtopping scenarios along the coastal defences from Pegwell Bay down to Kingsdown:

- For all breach and overtopping events, assessments were based on the 1 in 200yr (0.5% AEP) tidal flood event plus an allowance for climate change;
- From Pegwell Bay down to Sandwich Bay Estate – an overtopping scenario was selected due to the nature of the defences (stretches of sand dunes), using crest levels from the Photogrammetry data;
- From Sandwich Bay Estate down to Sandown Castle – breaching at 300m intervals along the coastal defence infrastructure, using 50m wide breaches in the defence embankments (representing a worst case breach scenario). This stretch of coastline is the highest risk area for breaching of flood defences and poses the greatest threat to Deal, due to the shingle flood defence embankment and the lower lying land behind the defences;
- From Sandown Castle to Kingsdown (where cliffs begin) – an overtopping scenario was selected here using defence crest levels from the NextMap data.

The River Dour is an undefended watercourse, hence these scenarios do not apply. The River Stour has no fluvial defences that offer a Standard of Protection of 1% AEP or above, so again these scenarios do not apply.

There are several limitations associated with the modelling. The accuracy of the modelled data is dependant on the accuracy of the Photogrammetry data and the data available on the flood defences. A 20m grid size was used for the J-FLOW modelling, which is considered appropriate for the broad scale assessment of an SFRA. For detailed site specific FRAs, a maximum grid size of 5m will be required.

4.2.2 Rapid inundation zones

For this SFRA, and after consultation with the Environment Agency, the Rapid Inundation Zone (RIZ) has been identified as areas which would flood to a depth of 200mm within 30 minutes of the flood defence overtopping or breaching. This was deemed suitable following guidelines outlined in the DEFRA document FD2321 - Flood Risks to People. This document indicates rapid flooding is that which occurs in less than one hour.

The formula below provides a means to calculate a Flood Hazard Rating for a given area. A rating greater than 1.25 indicates "Danger for most". Using these parameters, the Rapid Inundation Zone corresponds to the "Danger for Most" zone, thirty minutes after a breach. This is also described in the Flood Risks to People guidance as an area of "Significant" flood hazard.

The most recent flood hazard formula proposed by Phase 2 of the Risks to People Project is: Flood hazard = d. (v+0.5) +DF

Where:

d is depth (m)

v is velocity (ms^{-1})

DF is the debris factor with a value of 0-1.

The varying degrees of flood hazard are shown in Table 4-2.

Table 4-2 Hazard to people as a function of velocity and depth

Flood Hazard d.(v+0.5)	Degree of Flood Hazard	Description
<0.75	Low	Caution *"Flood Zone with shallow flossing water or deep standing water"*
0.75 – 1.25	Moderate	Dangerous for some (i.e. children) *"Danger: Flood zone with deep or fast flowing water"*
1.25 - 2.5	Significant	Dangerous for most people *"Danger: flood zone with deep fast flowing water"*
> 2.5	Extreme	Dangerous for all *"Extreme danger: flood zone with deep fast flowing water"*

Source: FD2321/TR1 Table 3.2

Areas that fall outside the Rapid Inundation Zone but still within Zone 3 of the Environment Agency's Flood Map do not automatically constitute land that is suitable for development. These areas are classified as 'High Risk' and could still be affected by flood water from breaching or overtopping of defences to significant depths and velocities within a period of hours.

4.2.3 High risk flood zone in Deal

In Deal there are locations that are susceptible to spray-water from waves crashing against the coastal defences and from prolonged periods of precipitation. This water can pond in lower lying areas and can flow through Deal (mainly along the High Street) if enough water collects. Potential development sites which could be affected by this zone have been highlighted in the tables in Chapter 5. This zone is also illustrated in Map C-1 of Appendix C.

4.2.4 Topography

Photogrammetry data have been made available for use in this SFRA, which covered most of the northern area of the Dover District. This information is in the form of a land surface level grid with a 2m grid resolution. NextMap data have also been utilised in this SFRA, which covered the entire Dover District region. This information is also in the form of a land surface level grid, but with a 5m grid resolution.

5 PROPOSED DEVELOPMENT OPTIONS

5.1 Flood Zone 1

For each area, allocations/potential future sites in Flood Zone 1 (FZ1) are tabulated, with their size (in hectares) and proposed number of dwellings.

From a flood risk perspective all land uses are acceptable within Flood Zone 1. Flood risk is not considered to be a significant constraint to development and all land uses listed below are appropriate in this zone.

- Essential infrastructure
- Highly vulnerable
- More vulnerable
- Less vulnerable
- Water compatible development

A site specific FRA will not usually be required for development in this zone unless there are, for example, historical records of localised flooding or site specific considerations that necessitate further investigation.

However, due to their potential impact on the local flood risk, a FRA will be required for all developments greater than **1 ha** in size. This will include further consideration of surface water drainage and onsite mitigation measures may be required, particularly where the capacity of the surface water sewer or receiving watercourse is limited. A FRA will be undertaken by the potential developer of the site. The Environment Agency will be able to advise potential developers as to their specific requirements on a site by site basis.

5.2 Flood Zone 1 Tables

Table 5-1 Proposed Greenfield development sites within Whitfield

Sites: **Option:**	**AAP18 – Land east of Whitfield (2 sites)** **2**	**DAAP – Land east of Whitfield** **3**	**Land west of Whitfield** **4**
OS NGR:	TR 3098 4494/3038 4596	TR 3094 4548	TR 2942 4580
Size (ha):	38.2 (combined)	36.0	159.8
Number of Dwellings:	900	890	4,000
Potential sources of flooding:	Groundwater flooding (unlikely unless development sited at lower elevations where throughflow from higher areas could have an impact), surface water/sewer flooding		
Historical flooding / Drainage on site:	No reports of flooding in Whitfield. Whitfield drains northwards to Whitfield pumping station adjacent to Sandwich Road, where it is then pumped back south.		
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Silty over chalk/deep loam to clay		
Indicative suitability for SUDS	Medium (see section 5.8)		
Brown / Greenfield:	Greenfield		
Additional information:	As Whitfield is located on a hill and these are Greenfield sites, increases in surface water run-off from new development could be an issue. An effective drainage system is important.		

Sites: **Option:**	**AAP18 – Land east of Whitfield (2 sites)** **2**	**DAAP – Land east of Whitfield** **3**	**Land west of Whitfield** **4**
Exception Test Applicable?	No		
Mitigation measures:	See section 5.7		
FRA Applicable?*	Yes		
Recommendations:	A FRA will be required due to the size of the site, to assess the potential impacts of any increase in surface water run-off and how this will be managed.		

** Site over 1ha in size require a Flood Risk Assessment*

Table 5-2 Proposed Brownfield development sites within Whitfield

Sites: **Option:**	**PDL/UC – Land adjacent to the Royal Oak PH** **1**	**PDL/UC – Car Parking, brownie hall etc** **1**	**PDL/UC – Esso petrol filling station** **1**	**LDF/PD – Land on Melbourne Avenue** **1**	**031155 – Old Park Barracks, Melbourne Avenue** **1**
OS NGR:	TR 3017 4578	TR 3011 4560	TR 3006 4467	TR 3040 4428	TR 3050 4415
Size (ha):	0.34	0.17	0.39	5.13	4.09
Number of Dwellings:	7	5	22	177	127
Potential sources of flooding:	Groundwater flooding (unlikely unless development sited at lower elevations where throughflow from higher areas could have an impact), surface water/sewer flooding.				
Historical flooding / Drainage on site:	No reports of flooding in Whitfield. Whitfield drains northwards to Whitfield pumping station adjacent to Sandwich Road, where it is then pumped back south.				
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology - Chalk Soil – Deep loam to clay/silty over chalk				
Indicative suitability for SUDS	Medium (see section 5.8)				
Brown / Greenfield:	Brownfield				
Additional information:	As Whitfield is located on a hill, increases in surface water run-off from new development could be an issue. An effective drainage system is important.				
Exception Test Applicable?	No				
Mitigation measures:	See section 5.7				
FRA Applicable?*	No	No	No	Yes	Yes
Recommendations:				A FRA will be required due to the size of the site, to assess the potential impacts of any increase in surface water run-off and how this will be managed.	

** Sites over 1ha in size require a Flood Risk Assessment*

Table 5-3 Proposed development sites within Aylesham

Sites: **Option:**	**LPA - Aylesham Expansion Area** **1**	**041446 – SE Market Square and Queens Road** **1**	**051024 – Aylesham Baptist Church** **1**
OS NGR	TR 2335 5278	TR 2376 5225	TR 2369 5209
Size (ha):	29.72	0.44	0.1
Number of Dwellings:	1,000	10	9
Sources of flooding:	Surface water/sewer flooding		
Historical flooding / Drainage on site:	Sewer flooding of the public open space west of Aylesham Railway Station. Existing drainage cannot cope with storm events in Aylesham.		
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology - Chalk Soil – Silty over chalk		
Indicative suitability for SUDS	High (see section 5.8)		
Brown / Greenfield:	Greenfield	Greenfield	Brownfield
Additional information:	Extra capacity has been allowed for in this new sewer system, for the proposed 1000 new dwellings (Aylesham Expansion Area). Work begun in October 2006 to improve the storm water sewer system in Aylesham to prevent future flooding in the area.		
Exception Test Applicable?	No		
Mitigation measures:	See section 5.7		
FRA Applicable?*	Yes	No	No
Recommendations:	A FRA will be required due to the size of the site, to assess the potential impacts of any increase in surface water run-off and how this will be managed (new sewer system has allowed for this development site).		

Table 5-4 All other proposed development sites within Flood Zone 1

Option	Site	Area (ha)	FRA Applicable?
1	050727 – 10 Green Lane, Eythorne	0.13	✗
1	971264 – Former RMSM, South Barracks, Canada Road	5.66	✓
1	UC/PDL – E H Brown & Son Timber Yard, 26/28 Mill Hill	0.52	✗
1	000848 – NCD Site, Beauchamp Avenue	0.15	✗
1	051174 – 95-99 Telegraph Road	0.07	✗
1	UC/PDL – The Yew Tree Hill PH, Mill Hill	0.41	✗
1	050078 – Land rear of and inc 144 Mill Hill	0.60	✗
1	050699 – 26-28 Mill Hill	0.30	✗
1	050618 – Land at Water Pumping	0.19	✗

Option	Site	Area (ha)	FRA Applicable?
	Station, St Richards Road		
1	040738 – Land to right of 223A-235 Telegraph Road	0.52	✗
1	051200 – Land r/o 14-56 Court Road, Station Drive	0.21	✗
1	030315 – Land r/o 7-13 Downlands and 6-8 The Maltings	1.30	✓
1	LPA – Eastry Hospital, Mill Lane, Eastry	3.27	✓
1	041409 – Land adjacent to Orchard Close, Staple Road, Wingham	0.93	✗
1	PDL/UC – Land west of the Dublin Man 'o' War PH, 110 Lower Road	0.09	✗
1	050036 – 33 London Road	0.14	✗
1	040379 – Contex House, Primrose Road	0.07	✗
1	LDF/PD – Coombe Valley Road	1.57	✓
1	PDL/UC – Land at Barwick Road	1.43	✓
1	030987 – Land at Barwick Road	2.26	✓
1	040378 – Former Builders Yard, Widred Road	0.14	✗
1	041139 – Former Astor Primary School, Astor Avenue	0.36	✗
1	051271 – Former Astor Primary School, Astor Avenue	1.04	✓
1	050089 – United Reformed Church, High Street	0.06	✗
1	PDL – Land adjacent Former Westmount College, Folkestone Road	1.09	✓
1	020112 – 245-249 Folkestone Road	0.03	✗
1	030369 – 1A Belgrave Road	0.08	✗
1	050114 – 183-185 Folkestone Road	0.06	✗
1	050420 – 126 Folkestone Road	0.04	✗
1	050785 – Webbs Hotel, 161-165 Folkestone Road	0.33	✗
1	020998 – Malvern Road	0.07	✗
1	040897 – 83-87 Folkestone Road	0.04	✗
1	050217 – 65-67 Folkestone Road	0.18	✗
1	051177 – 56-57 Biggin Street	0.03	✗
1	010097 – 1-13 York Street and 27-30 Queens Gardens	0.06	✗
1	040957 – 14-15 Cannon Street	0.02	✗
1	040938 – Prince of Wales House, Princes Street	0.08	✗
1	041527 – Orange Tree PH, 357 Folkestone Road	0.04	✗
1	040365 – Former Westmount College, Folkestone Road	0.22	✗
1	031139 – 22 Park Avenue	0.13	✗
1	050775 – 14 Godwyne Road	0.08	✗
1/2	LDF/PD - Garage site, Kingsdown	0.26	✗

Option	Site	Area (ha)	FRA Applicable?
	Road, Kingsdown		
1/2	LDF/PD – Land south of Upper Street, Kingsdown	0.19	✗
1/2	LDF/PD – Land south of Sandwich Road, Ash	3.34	✓
1/2	Former Council Yard, Molland Lea, Ash	0.15	✗
2	AAP15 – Connaught barracks	12.68	✓
2	SA – Land at Cauldham Lane	0.76	✗
2	SA – Land south of New Dover Road	1.42	✓
2	SA – Land off Mill Lane	0.36	✗
2	SA – Eastry Court Farm	1.13	✓
2	SA – Land adjacent to Wingham Primary School	0.25	✗
3	SA – Land adjacent Langdon Primary School	0.33	✗
3	SA – Land adjacent to Homestead	0.82	✗
3	SA – Land east of Monkton Court Lane	1.91	✓
3	SA – East Studdal Nursery	1.01	✓
3	SA – Laslett's Yard, Beacon Lane	0.17	✗
3	SA22 – Land south of Sandwich Road	3.18	✓
3	SA – Land adjacent to St Edmund's Road	2.15	✓
3	SA18 - Land at Station Road	4.70	✓
Employment Sites	Employment sites in FZ1 in the district will require an FRA as they are all bigger than 1ha in size. However, it is worth noting that they are classified as 'less vulnerable' developments so the FRA may not need to be as detailed.	>1	✓

5.3 Flood Zones 2 and 3

Following on from Flood Zone 1, potential development sites in Flood Zones 2 and 3 (FZ 2 and FZ 3, respectively) are tabulated below.

Sites within Zone 2

Subject to the application of the Sequential Flood Risk Test, PPS25 specifies suitable types of development in this zone as:

- Essential infrastructure
- More vulnerable
- Less vulnerable
- Water compatible development

It is not for the SFRA to assess whether the site will pass parts a. and b. of the Exception Test. The Council must be able to demonstrate the need for development through the spatial planning process.

A Flood Risk Assessment will be required for all development in this zone. The Flood Risk Assessment will need to assess the current level of flood risk as well as the level of flood risk following development. Development plans for the site will need to demonstrate that flood risk can be effectively and safely managed without increasing flood risk elsewhere.

Proposals will also need to demonstrate that access and egress to the development can be maintained during an extreme flood event and that development is set at an appropriate level. A further level of analysis may be required where development is planned behind or adjacent to existing defences in order to test the sustainability and robustness of the mitigation measures. In keeping with Flood Zone 1 other flood risk constraints, such as incidents of localised flooding and other site specific considerations will need to be addressed. Again, Flood Risk Assessments will be undertaken by the developer of the site and the Environment Agency will be able to advise potential developers as to their specific requirements on a site by site basis. The Flood Risk Assessment will need to address part c of the Exception Test.

Sites within Zone 3

Flood Zone 3 is subdivided into Zones 3a and 3b. Zone 3a is potentially suitable for water-compatible and less vulnerable land uses. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Highly vulnerable development should not be permitted in this zone. Only water-compatible uses and the essential infrastructure should be permitted in Zone 3b.

PPS25 implies that it is not necessary to apply the Exception Test to employment allocations within Zone 3a. However, the different requirements for employment and housing allocations may be reviewed following consultation. For completeness, it is recommended that the Exception Test is also applied to employment (less vulnerable) allocations and potential future sites. Again, this is considered a proactive approach, developing good consistent practice to managing flood risk.

A Sequential Flood Risk Test is used to prioritise sites in order of vulnerability to flood risk and their acceptability in terms of allocation for development. Development plans should primarily focus on lower Flood Zones in preference to Flood Zone 3.

Where sites are partially located within Flood Zone 3, it is recommended that the Council should avoid development by specifying water compatible uses or Public Open Space for these areas.

Any proposals for development within Flood Zone 3 will require developers to undertake a detailed Flood Risk Assessment. It should be noted that constraints to development are likely to be significant and developers should seek advice from the Environment Agency as to the specific requirements for assessment.

Sites within Zones 1, 2 and 3

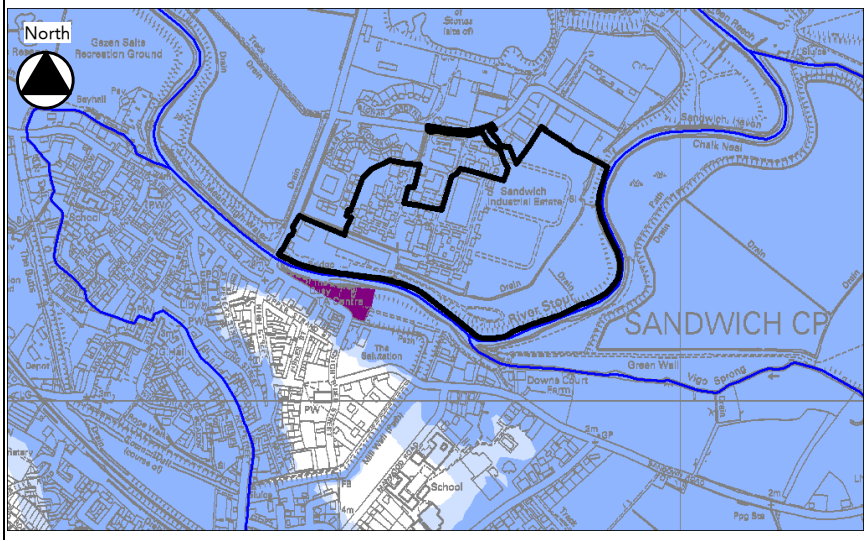
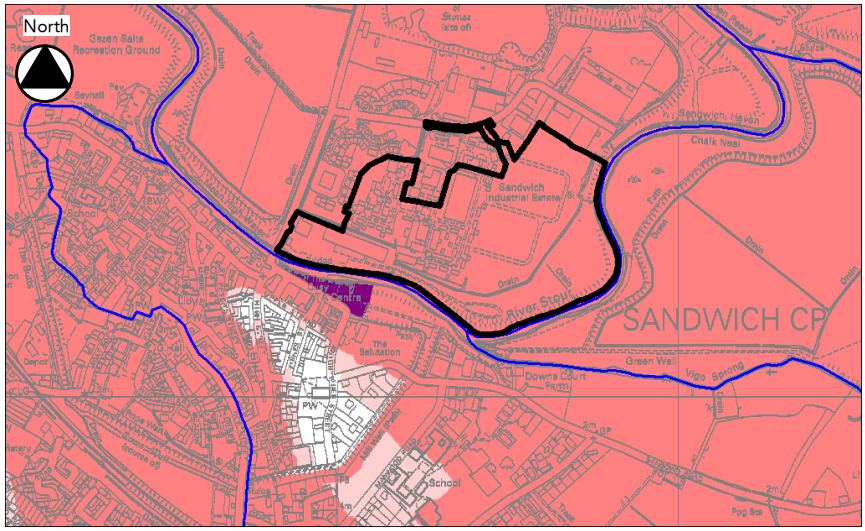
There are a number of sites which are partly located within a range of Flood Zones. In accordance with PPS25, development should be located in the area at lowest risk of flooding. If the sites are retained for development, the Council will need to address flood risk at each of these locations. Where this is the case, the Council may consider implementing one of the following options for each site:

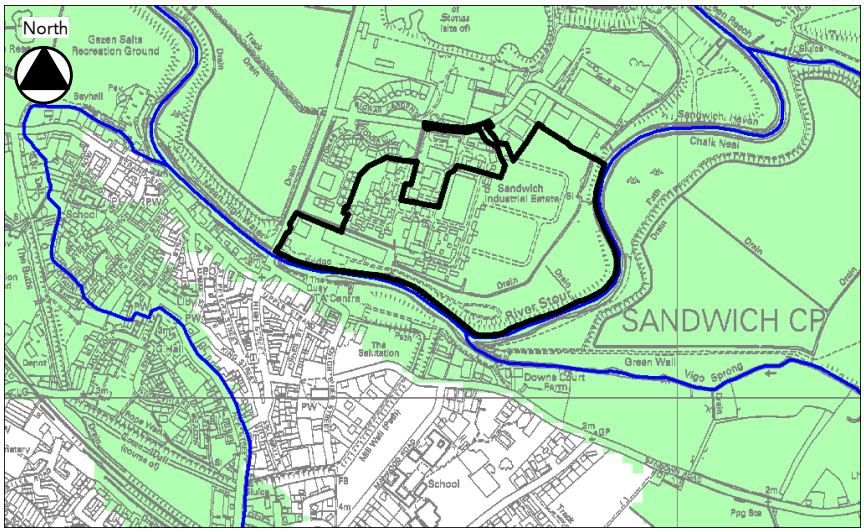
- To adjust the development footprint for each site so that the allocated area is contained in Flood Zones 1 and 2. This option may include using areas vulnerable to flooding as areas of public open space and for habitat creation and environmental improvement
- Consider the requirements of the Exception Test (where this is applicable) and whether it is likely that this can be passed.

5.4 Proposed development sites (housing) within Flood Zones

5.4.1 Sandwich Area

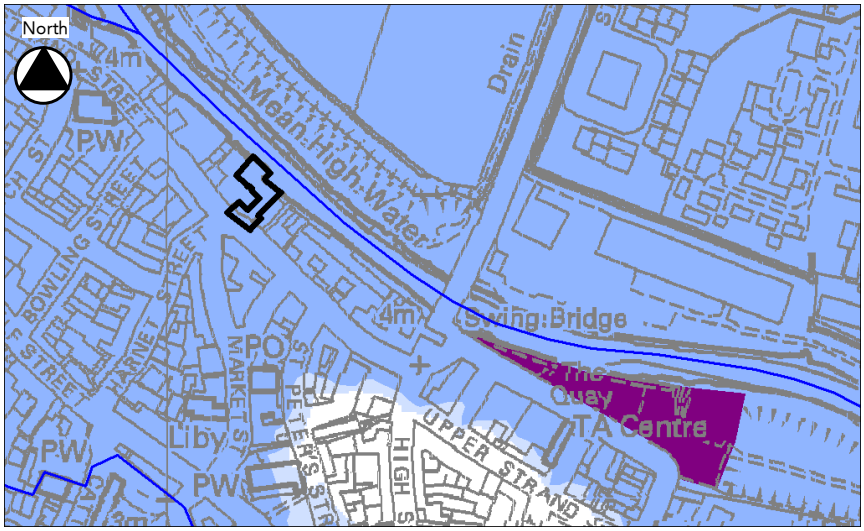
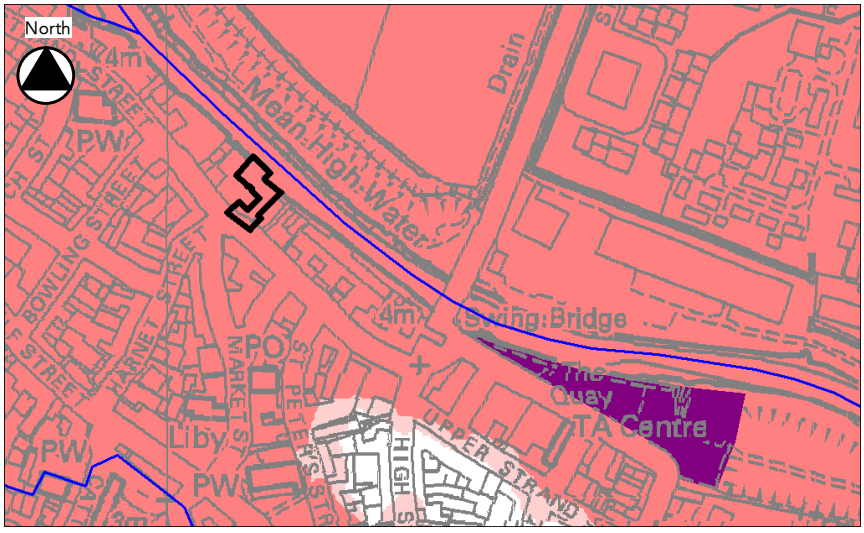
Table 5-5 Development site at Land north of the River Stour, Ramsgate Road

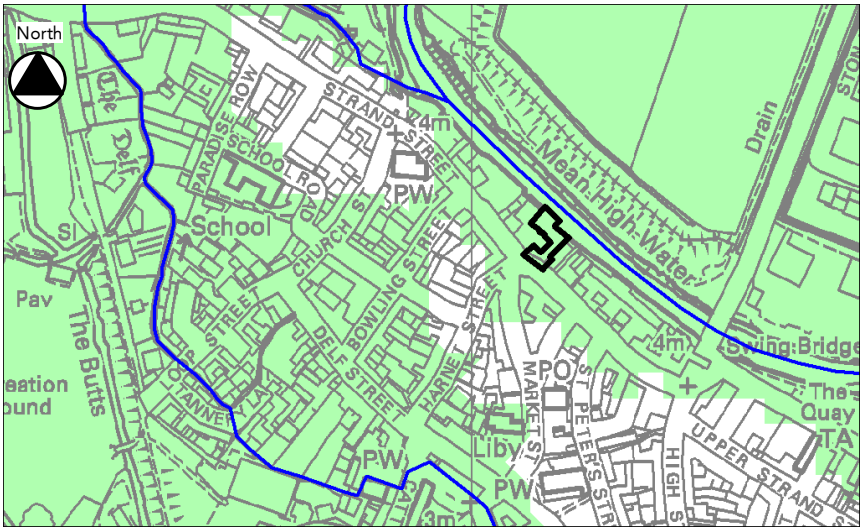
Site: **Option:**	**011167 – Land north of the River Stour, Ramsgate Road and part of Sandwich Industrial Estate** **1**
OS NGR:	TR 3361 5830
Size (ha):	15.62
Number of Dwellings:	247
Planning Permission Granted?	Yes – part implemented and included extensive bunding to overcome flood issues
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ2 0%, FZ3a 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change (CC) coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ2CC 0%, FZ3aCC 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – River Stour
Sources of Flooding:	Surface water run-off could be an issue due to the wet clay soil and

Site: **Option:**	**011167 – Land north of the River Stour, Ramsgate Road and part of Sandwich Industrial Estate** **1**
	underlying chalk. This could also lead to groundwater flooding problems.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial – Raised defence embankment along Stour left bank
Historical flooding / Drainage on site:	No historical flooding records on the site No drainage information available
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Sandstone and chalk Soil – Seasonally wet deep clay
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Yes – The Tidal Great Stour from Pegwell Bay to Fordwich. The site is located within the loop of the River Stour through Sandwich ('Stonar loop'), the flows through which are controlled by the Stonar Cut. The cut is controlled by sluice gates that are opened during times of flood, to allow water to bypass the loop, and drain out to the Pegwell Bay quicker. This effectively decreases the flood risk to properties in Sandwich.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low to Medium, as long as the site specific FRA provides satisfactory evidence to show that the Stonar Cut, coupled with the existing defences provides adequate protection.
Flood risk type and location:	Overtopping of dunes at Pegwell Bay results in surge up the Tidal Stour, overtopping the defences.
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Overtopping /Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Indicative range of Modelled Flood Depths (m):	0.4 – 1.8
Indicative range of Modelled Flood Velocities (m/s):	0.4 – 1.6
Time to inundation from point of overtopping or breach (hrs):	5
In Rapid Inundation Zone?	No

Site: **Option:**	**011167 – Land north of the River Stour, Ramsgate Road and part of Sandwich Industrial Estate** **1**
Mitigation Measures:	See section 5.7
Recommendations:	A site specific FRA is required, which needs to take into account the risk of flooding as a result of a tidal surge, and the SoP of defences. It will be necessary to address both tidal and fluvial flood risk. As the site lies within the breach/overtopping outline (tidal risk), then flood compensation will be necessary. It is believed that the defences in this area offer a lower SoP than PPS25 specifies, and therefore could be classified as 'undefended' meaning that any loss in floodplain storage would need to be accounted for elsewhere (fluvial risk). If the SoP for the defences is increased in line with PPS25 (i.e. 1 in 100yr protection), then breach scenarios will need to analysed in the FRA and due to the proximity of the site to the defences, it will more than likely lie within a rapid inundation zone. Development should not occur right up to the defences to allow access for maintenance. If any development is permitted it will be necessary to ensure that defences are maintained in good condition for the next 100 years. ***Alternative sites should be explored in lower flood risk areas.***

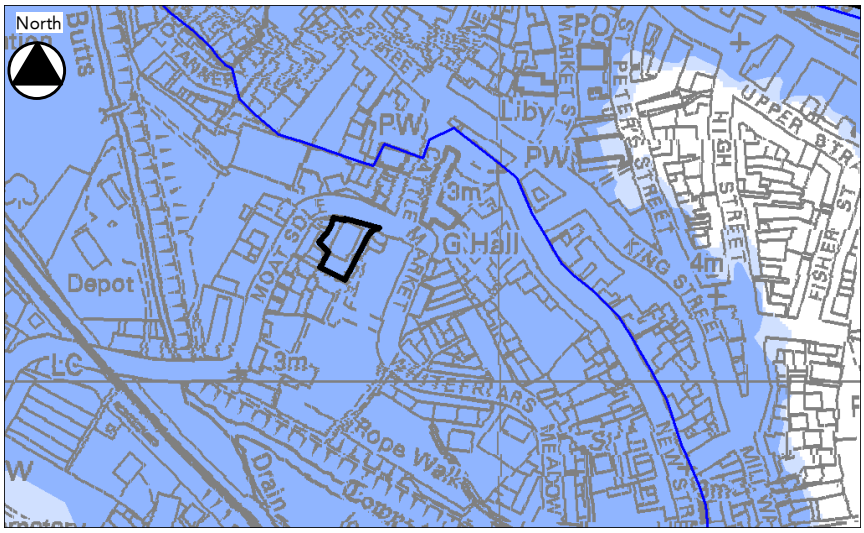
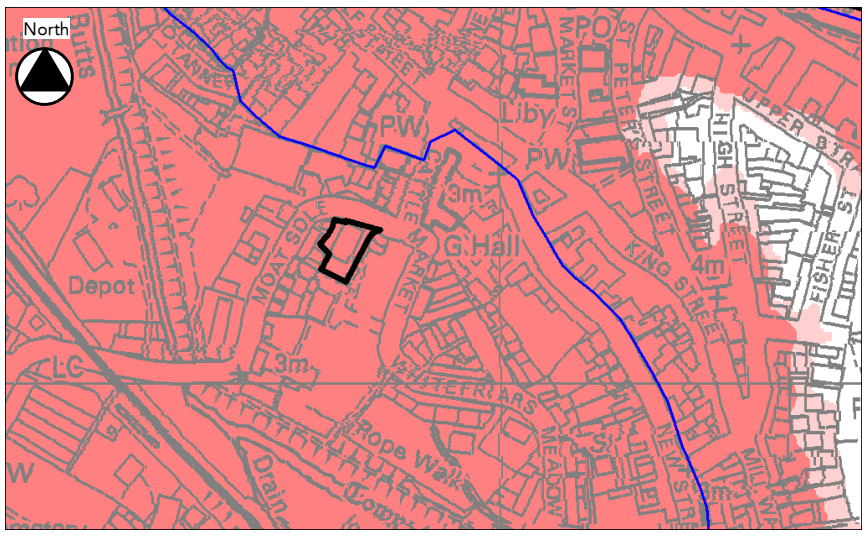
Table 5-6 Development site at West of Pillory gate Wharf, Strand Street

Site: **Option:**	**000412 – West of Pillory Gate Wharf, Strand Street** **1**
OS NGR:	TR 3306 5835
Size (ha):	0.07
Number of Dwellings:	9
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ2 0%, FZ3a 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ2CC 0%, FZ3aCC 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – River Stour
Sources of Flooding:	Surface water run-off could be an issue due to the wet clay soil and that the site is lower than the surrounding development.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial – Raised defence embankment along Stour right bank
Historical flooding / Drainage on site:	Site flooded in February 1983 – tidal surge overtopped the defence embankment affecting 10 residential and 6 commercial properties.

Site: 000412 – West of Pillory Gate Wharf, Strand Street Option: 1	
	No information on drainage for the site.
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Sandstone Soil – Seasonally wet deep clay
Indicative suitability for SUDS:	Low to medium - see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: The Tidal Great Stour from Pegwell Bay to Fordwich.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low to Medium
Flood risk type and location:	Overtopping of dunes at Pegwell Bay results in surge up the Tidal Stour, overtopping the defences.
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Overtopping /Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Indicative range of Modelled Flood Depths (m):	0.6 – 2.0
Indicative range of Modelled Flood Velocities (m/s):	0.5 – 1.0
Time to inundations from point of overtopping or breach (hrs):	5.5
In RIZ?	No
Mitigation Measures:	See section 5.7
Recommendations:	Site specific FRA required with the emphasis on the risk of flooding as a result of a tidal surge, and the SoP of defences. It will be necessary to address both tidal and fluvial flood risk. As the site lies within the breach/overtopping outline, then flood compensation will be necessary. It should be noted that if the SoP for the defences is increased in line with PPS25 (i.e. 1 in 100yr protection), then breach scenarios will need to analysed in the FRA and due to the proximity of the site to the defences, it will more than likely lie within a rapid inundation zone. Development should not occur right up to the defences to allow access for maintenance. If any development is permitted it will be necessary to ensure that defences are maintained in good condition for the next 100 years.

Site: Option:	000412 – West of Pillory Gate Wharf, Strand Street 1
	Alternative sites should be explored in lower flood risk areas.

Table 5-7 Development site at Malcolm Waite Ltd.

Site: Option:	Malcolm Waite Ltd. Moat Sole 1
OS NGR:	TR 3289 5809
Size (ha):	0.1
Number of Dwellings:	8
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ2 0%, FZ3a 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ2CC 0%, FZ3aCC 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – The Delf Stream
Sources of Flooding:	Surface water run-off could be an issue due to poor drainage in the clay soil

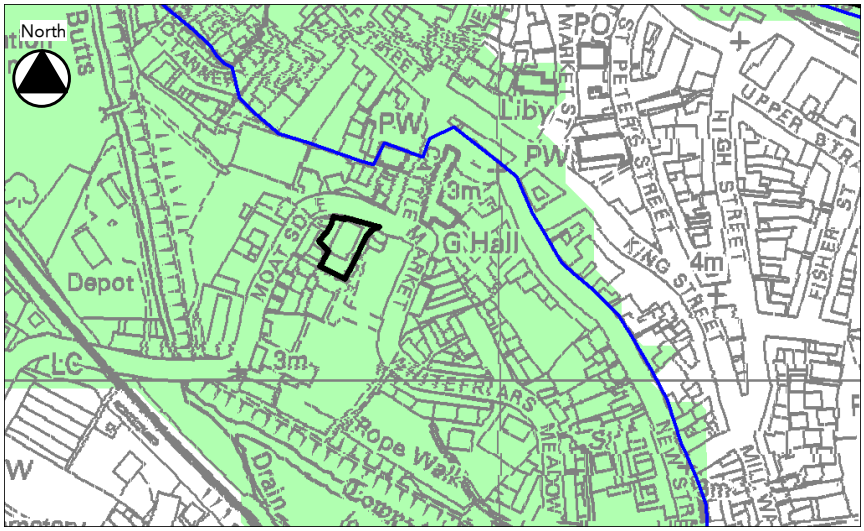
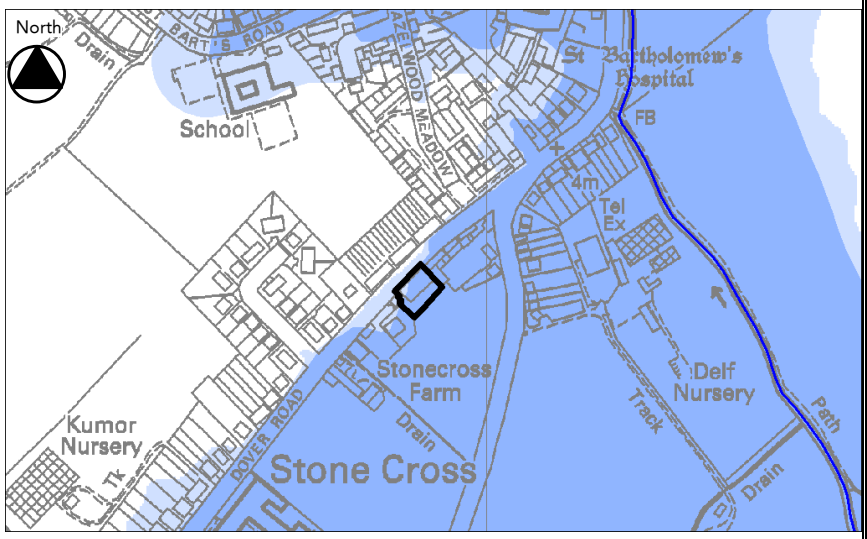
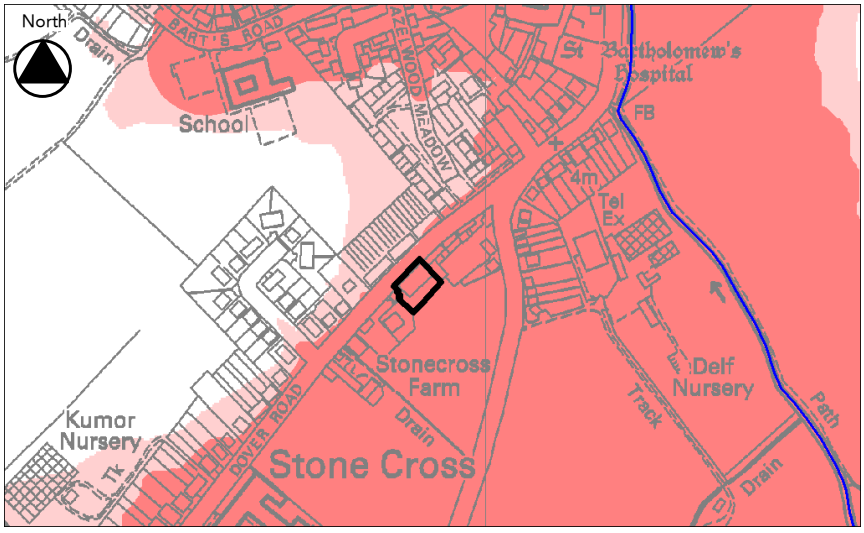
Site: Option:	Malcolm Waite Ltd. Moat Sole 1
	and as the site is lower than the surrounding development.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial – Culverted and maintained channel stretch of The Delf Stream
Historical flooding / Drainage on site:	Moat Sole and Cattle Market area affected in June 2007, following approx 50mm of rainfall in 2hrs, due to Delf Stream (main river) already at capacity and storm drains unable to discharge. One cellar and one garden flooded *(Source EA Ops Team).*
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Sandstone Soils – Seasonally wet deep clay
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: The Tidal Great Stour from Pegwell Bay to Fordwich.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low to medium
Flood risk type and location:	Overtopping of dunes at Pegwell Bay results in surge up the Tidal Stour, overtopping the defences.
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Indicative range of Modelled Flood Depths (m):	1.3 – 1.5
Indicative range of Modelled Flood Velocities (m/s):	0.8 – 1.1
Time to inundations from point of overtopping or breach (hrs):	6
In RIZ?	No
Mitigation Measures:	See section 5.7
Recommendations:	Site specific FRA required that addresses both fluvial and tidal risk. Floodplain compensation will be required, and floor levels will need to be raised. ***Alternative sites should be explored in lower flood risk areas.***

Table 5-8 Development site at The Bargain Shop, Dover Road

Site: **Option:**	**041497 – The Bargain Shop, 68 Dover Road** **1**
OS NGR:	TR 3293 5725
Size (ha):	0.11
Number of Dwellings:	5
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 80%, FZ2 20%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ2CC 0%, FZ3aCC 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – The Delf
Sources of Flooding:	Possible surface runoff flooding as is slightly lower than neighbouring areas.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial - none
Historical flooding / Drainage on site:	No information available

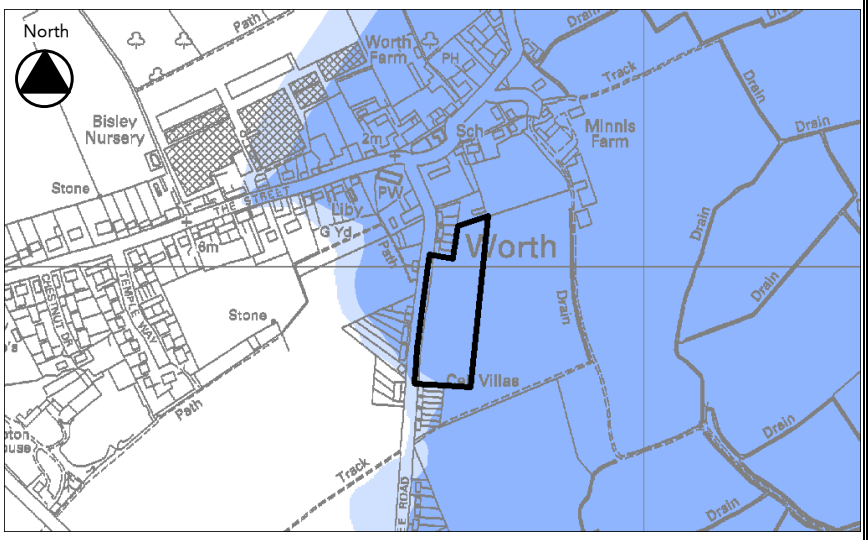
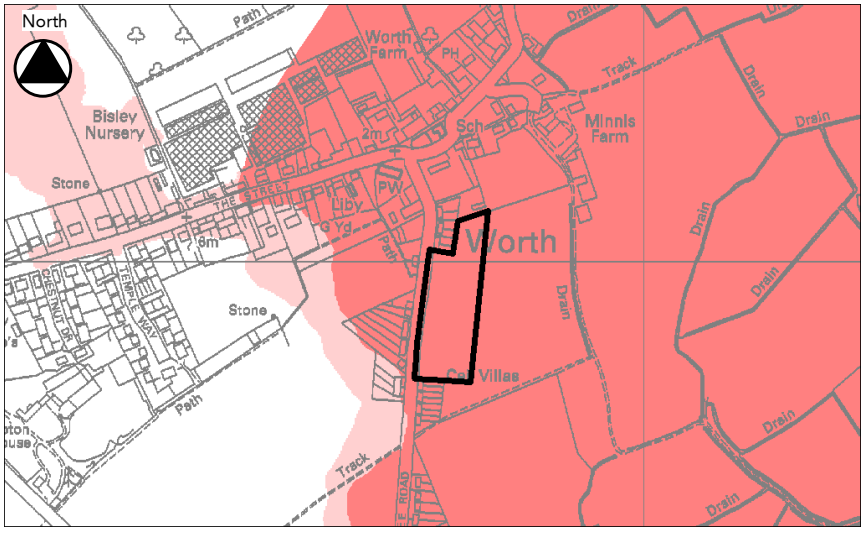
Site: Option:	041497 – The Bargain Shop, 68 Dover Road 1
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology - Sandstone Soils – Deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: The Tidal Great Stour from Pegwell Bay to Fordwich.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to High
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	The fluvial risk from the Delf Stream needs to be assessed in the site specific FRA. Raising of floor levels and flood compensation may be necessary, but these will need to be assessed as part of a detailed FRA and through discussion with the Environment Agency.

Table 5-9 Development site at The Street, Worth

Site: **Option:**	**LDF/PD – land to the right of properties at The Street, Worth** **1**
OS NGR:	TR 3347 5600
Size (ha):	0.15
Number of Dwellings:	5
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	Site lies outside of FZ3a and FZ2 – FZ1 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ2CC 5%, FZ3aCC 0%, FZ1 95%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – Drainage network
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial - none
Historical flooding / Drainage on site:	No information available

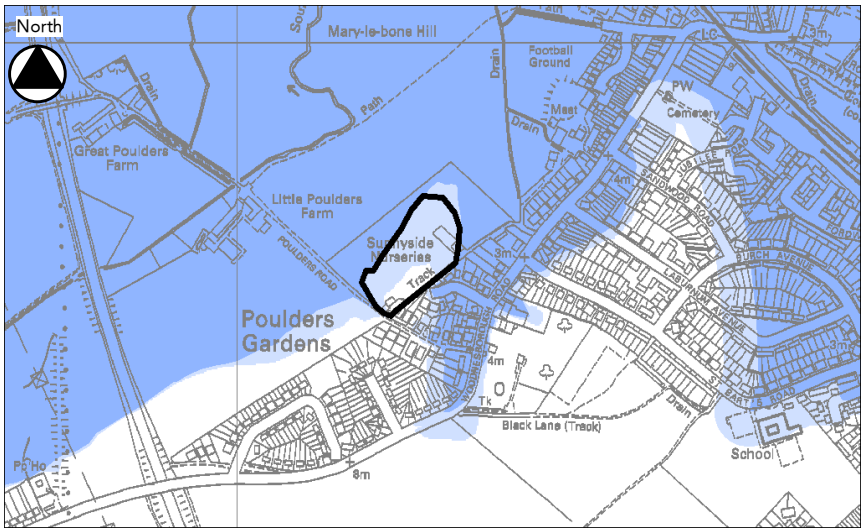
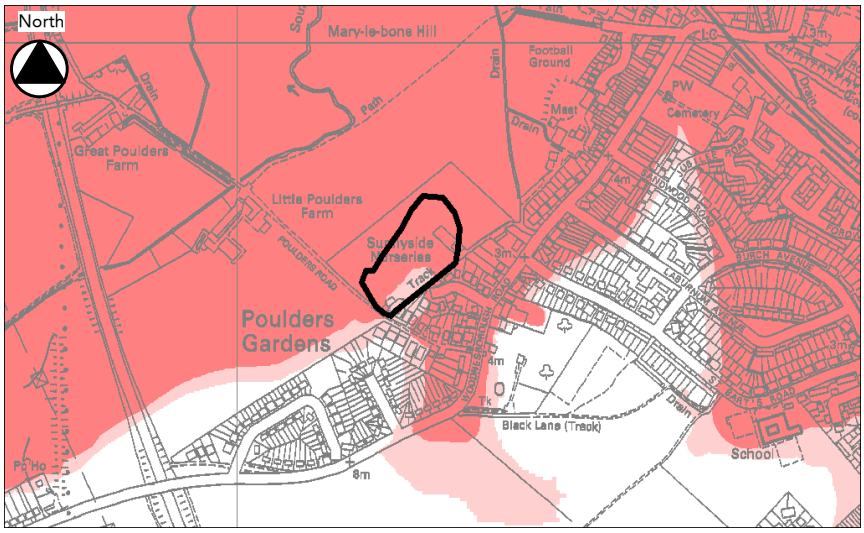
Site: **Option:**	**LDF/PD – land to the right of properties at The Street, Worth** **1**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No
Likelihood of passing Test:	N/A
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	The SFRA has illustrated that the risk to this site is small, and the risk of problems with developing this site are considered to be small. However, a site specific FRA will be required that will need to assess the fluvial risk from the drainage network, and as the site is Greenfield it must be demonstrated that surface water/runoff will be managed.

Table 5-10 Development site at Jubilee Road, Worth

Site: **Option:**	**Land to the east of Jubilee Road, Worth** **1 (also identified option 3)**
OS NGR:	TR 3376 5593
Size (ha):	1.27
Number of Dwellings:	15
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 96%, FZ2 4%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – Drainage network to the east
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial - none
Historical flooding / Drainage on site:	No information available

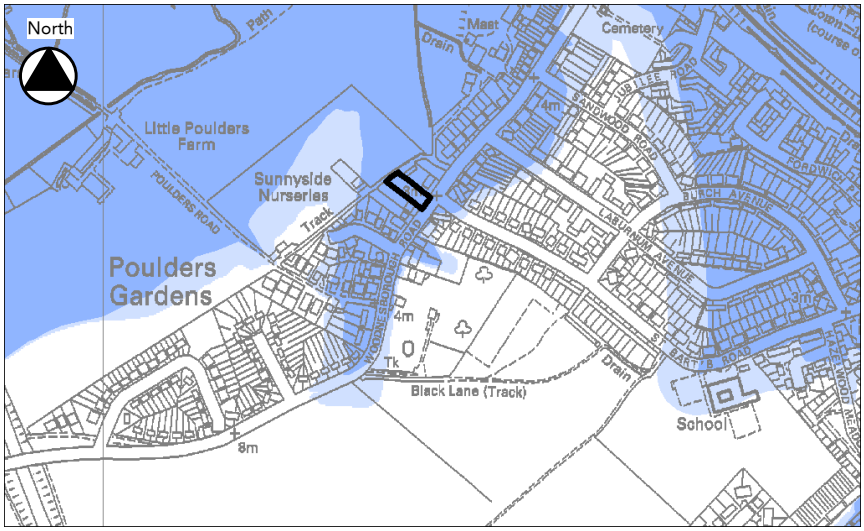
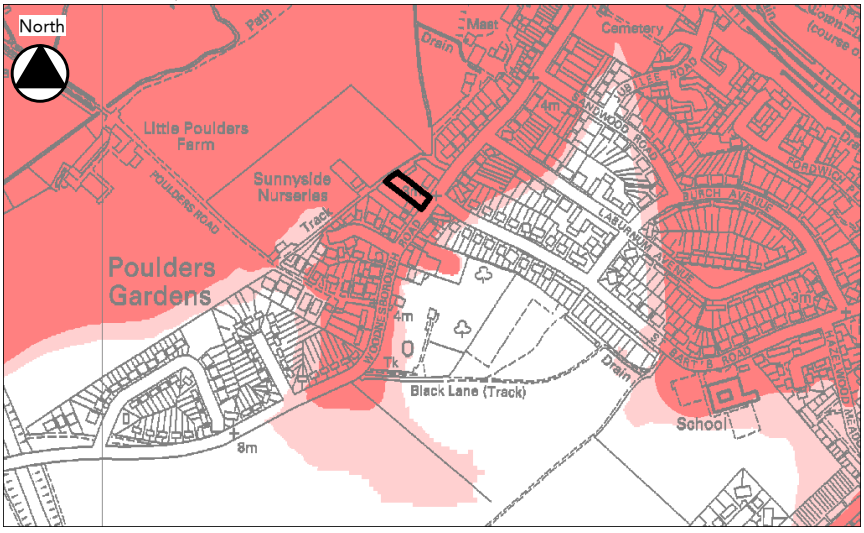
Site: **Option:**	**Land to the east of Jubilee Road, Worth** **1 (also identified option 3)**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal Areas from Pegwell Bay to Folkestone
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to high
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	The fluvial risk from the drainage network needs to be assessed in the site specific FRA. Raising of floor levels* and flood compensation may be necessary, but these will need to be assessed as part of the FRA and through discussion with the Environment Agency. * There could be possibilities for land raising, as it believed that flooding depths in the southern area of the site are quite shallow.

Table 5-11 Development site at Sunnyside Nurseries, Woodnesborough Road

Site: **Option:**	**SA – Sunnyside Nurseries, Woodnesborough Road** **2**
OS NGR:	TR 3226 5768
Size (ha):	1.37
Number of Dwellings:	37
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 0%, FZ2 78%, FZ1 22%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 83%, FZ2CC 17%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – Drainage network
Sources of Flooding:	Possible groundwater flooding due to the drainage into this area.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial - none
Historical flooding / Drainage on site:	No information available

Site: **Option:**	**SA – Sunnyside Nurseries, Woodnesborough Road** **2**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Sandstone Soil – Deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: The Tidal Great Stour from Pegwell Bay to Fordwich.
Exception Testing	
Exception Test Applicable?	No, not based on current flood zones, but the Environment Agency may stipulate that the Exception Test will be necessary as it falls within FZ3a when climate change is taken into account.
Likelihood of passing Test:	Medium to High
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	Although the SFRA shows the site to lie just outside the current FZ3a, a more detailed FRA will be required to confirm this. Discussions with the Environment Agency will be necessary, due to the significant increase in flood risk to the site once climate change has been taken into account.

Table 5-12 Development site at Woodnesborough Road

Site: **Option:**	**SA – Land between 127 and 131 Woodnesborough Road** **2**
OS NGR:	TR 3258 5769
Size (ha):	0.1
Number of Dwellings:	5
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – Drainage network
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial - none
Historical flooding / Drainage on site:	No information available

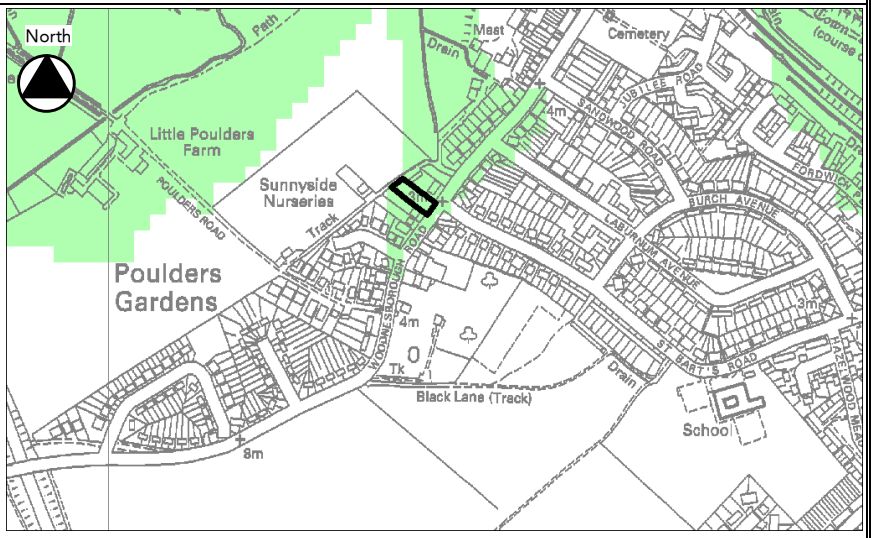
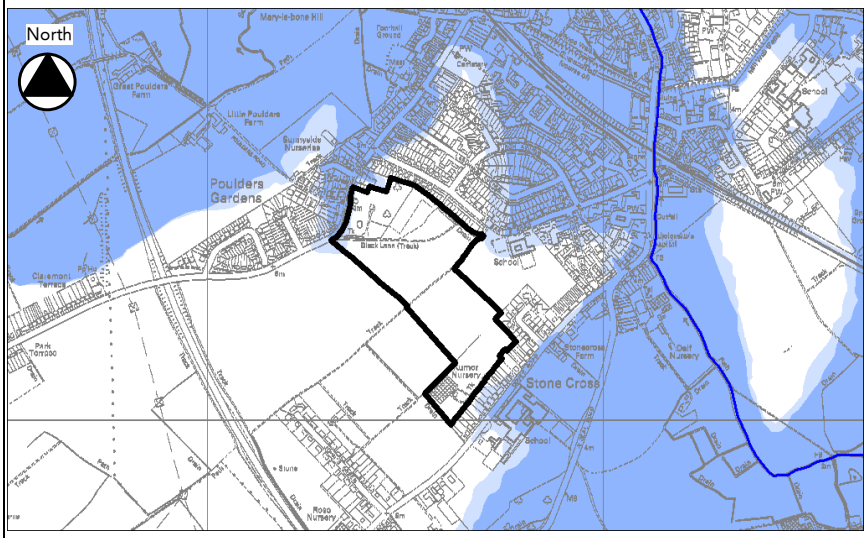
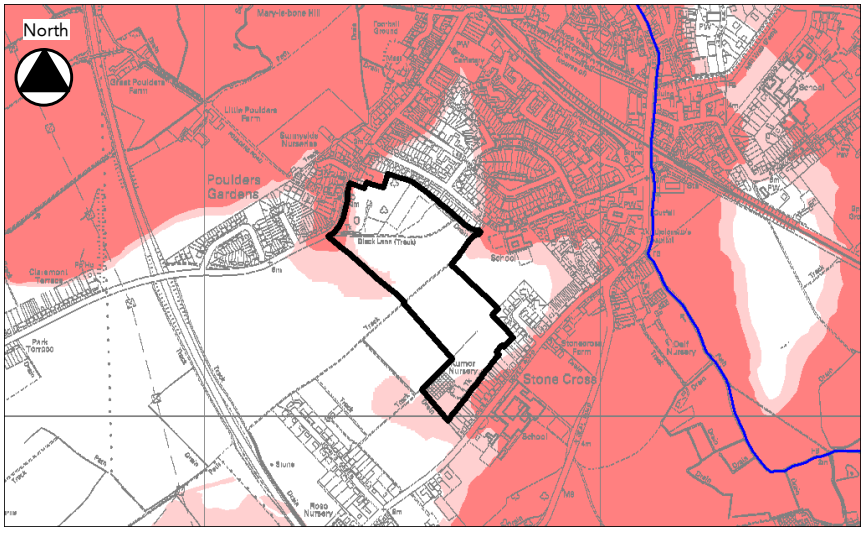
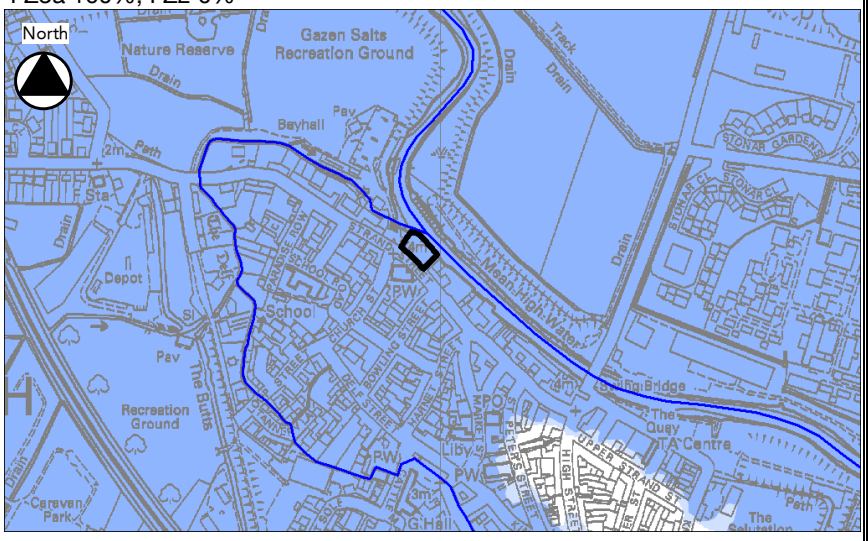
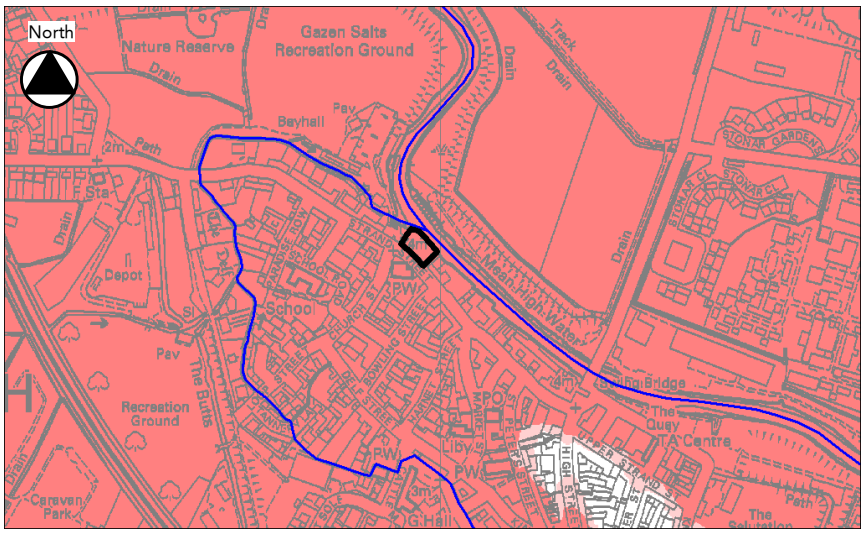
Site: Option:	SA – Land between 127 and 131 Woodnesborough Road 2
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: The Tidal Great Stour from Pegwell Bay to Fordwich.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low to medium
Flood risk type and location:	Overtopping of dunes at Pegwell Bay results in surge up the Tidal Stour, overtopping the defences.
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Indicative range of Modelled Flood Depths (m):	0.8 – 0.9
Indicative range of Modelled Flood Velocities (m/s):	0.6 – 0.8
Time to inundations from point of overtopping or breach (hrs):	6
In RIZ?	No
Mitigation Measures:	See section 5.7
Recommendations:	Site specific FRA required that addresses both fluvial and tidal risk. Floodplain compensation will be required, and floor levels will need to be raised. ***Alternative sites should be explored in lower flood risk areas.***

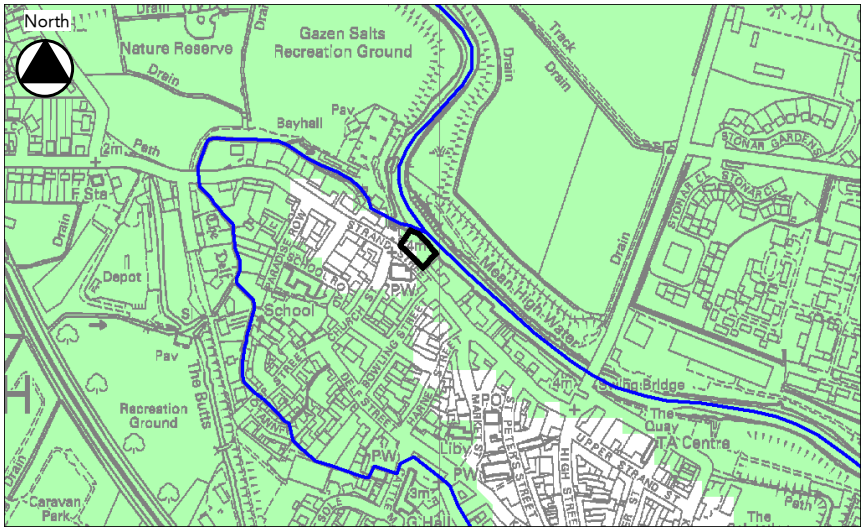
Table 5-13 Development site at St. Bart's Road

Site: **Option:**	**Sa – Land to the west of St Bart's Road** **2**
OS NGR:	TR 3255 5731
Size (ha):	11.80
Number of Dwellings:	100
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 0%, FZ2 2%, FZ1 98%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 2%, FZ2 CC 15%, FZ1 83%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – The Delf Stream
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial - none
Historical flooding / Drainage on site:	No information available

Site: **Option:**	**Sa – Land to the west of St Bart's Road** **2**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: The Tidal Great Stour from Pegwell Bay to Fordwich.
Exception Testing	
Exception Test Applicable?	No
Likelihood of passing Test:	N/A
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	The SFRA has illustrated that the risk to this site is small, and the risk of problems with developing this site are considered to be small. However, a site specific FRA will be required that will need to assess the fluvial risk from the Delf Stream, and as the site is Greenfield it must be demonstrated that surface water/runoff will be managed.

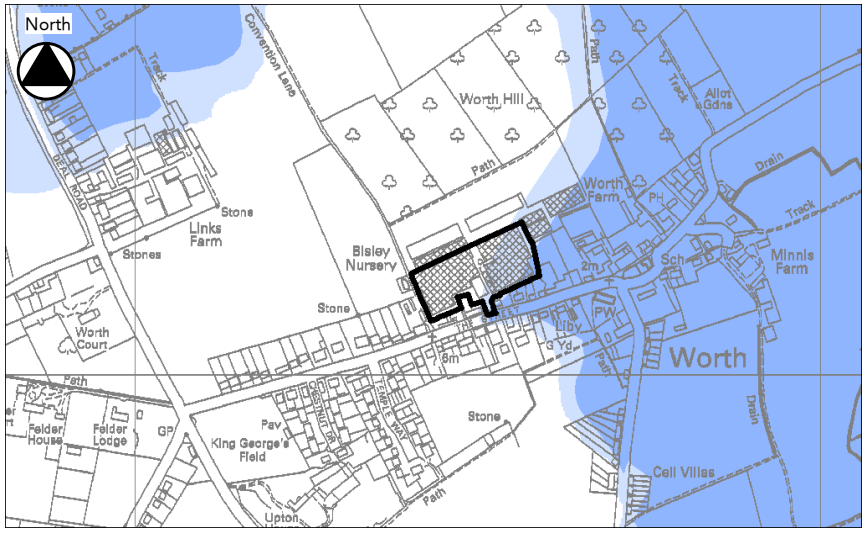
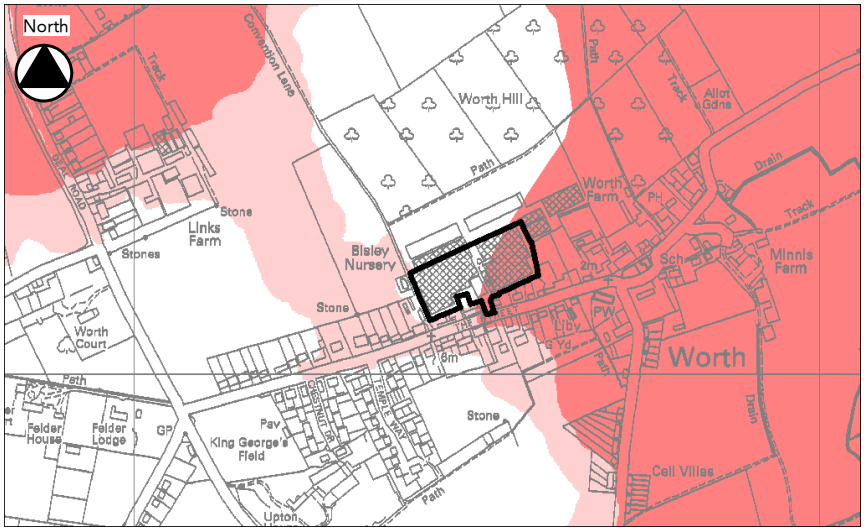
Table 5-14 Development site at Jesus Quay

Site: **Option:**	**SA – Jesus Quay** **2**
OS NGR:	TR 3297 5844
Size (ha):	0.11
Number of Dwellings:	12
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – River Stour and the Delf Stream
Sources of Flooding:	Surface water run-off could be an issue due to the poor drainage of clay soil and that the site is lower than the surrounding development.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial – Raised defence wall on right hand bank of River Stour
Historical flooding /	Site flooded in February 1983 – tidal surge overtopped the defence

Site: **Option:**	**SA – Jesus Quay** **2**
Drainage on site:	embankment affecting 10 residential and 6 commercial properties. No information on drainage for the site.
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Sandstone Soil – Seasonally wet deep clay
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: The Tidal Great Stour from Pegwell Bay to Fordwich.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low to medium
Flood risk type and location:	Overtopping of River Stour flood defence (known from historical flooding) and dunes at Pegwell Bay (modelling)
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Overtopping /Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Indicative range of Modelled Flood Depths (m):	0.5 – 1.0
Indicative range of Modelled Flood Velocities (m/s):	0.4 – 1.2
Time to inundations from point of overtopping or breach (hrs):	5.5
In RIZ?	No
Mitigation Measures:	See section 5.7
Recommendations:	Site specific FRA required with the emphasis on the risk of flooding as a result of a tidal surge, and the SoP of defences. It will be necessary to address both tidal and fluvial flood risk. As the site lies within the breach/overtopping outline, then flood compensation will be necessary. It should be noted that if the SoP for the defences is increased in line with PPS25 (i.e. 1 in 100yr protection), then breach scenarios will need to analysed in the FRA and due to the proximity of the site to the defences, it will more than likely lie within a rapid inundation zone. Development should not occur right up to the defences to allow access for maintenance. If any development is permitted it will be necessary to ensure

Site: Option:	SA – Jesus Quay 2
	that defences are maintained in good condition for the next 100 years. ***Alternative sites should be explored in lower flood risk areas.***

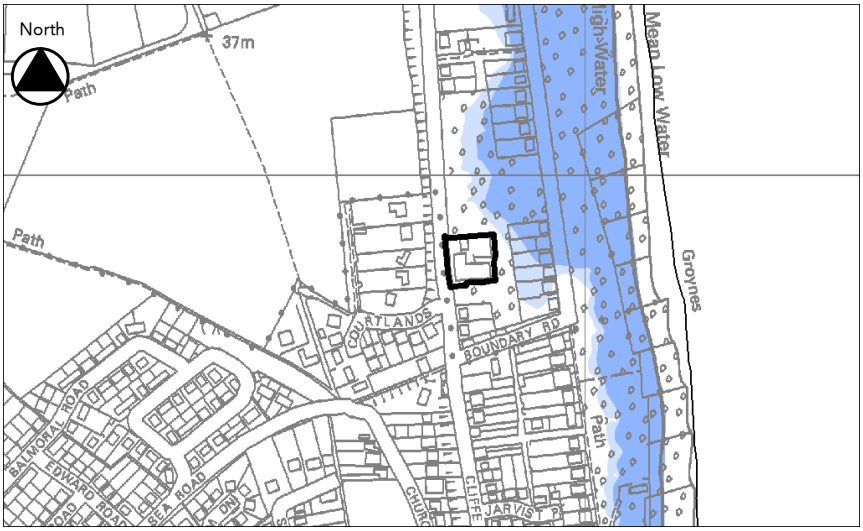
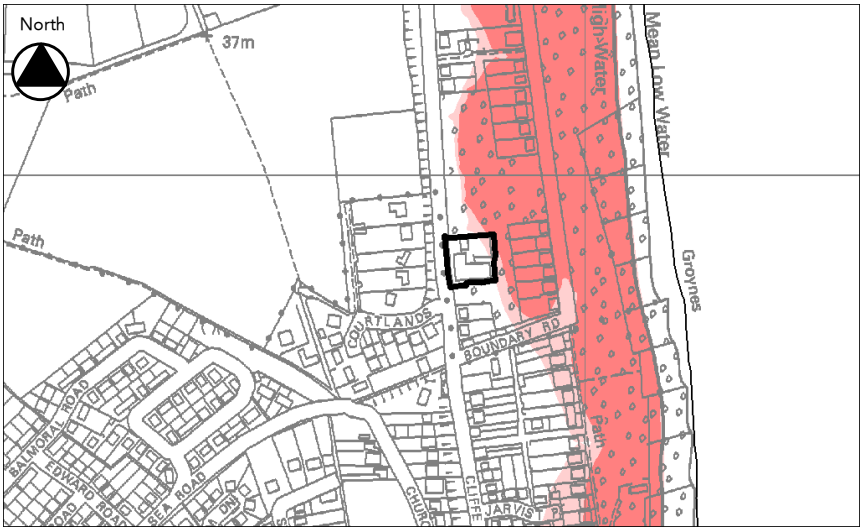
Table 5-15 Development site at Bisley Nurseries

Site: Option:	SA – Bisley Nurseries, The Street 3
OS NGR:	TR 3348 5615
Size (ha):	1.41
Number of Dwellings:	50
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3 Flood Zone 2	FZ3a 5%, FZ2 35%, FZ1 60%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3 CC Flood Zone 2 CC	FZ3aCC 40%, FZ2 CC 0%, FZ1 60%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.

Site: **Option:**	**SA – Bisley Nurseries, The Street** **3**
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to High
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	The SFRA has illustrated that the risk to this site is small, and the risk of problems with developing this site are considered to be small. However, a site specific FRA will be required, and as the site is Greenfield it must be demonstrated that surface water/runoff will be managed.

5.4.2 Deal area

Table 5-16 Development site at Kingsdown Road

Site: **Option:**	**SA – Garage site, Kingsdown Road** **2 (also identified in option 1)**
OS NGR:	TR 3787 4890
Size (ha):	0.26
Number of Dwellings:	10
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	Site lies outside of FZ3 and FZ2 – FZ1 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 1%, FZ2 CC 11%, FZ1 88%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Natural shingle ridge and embankment between 200m South of Pier and Kingsdown
Historical flooding / Drainage on site:	Groundwater flooding due to high water table

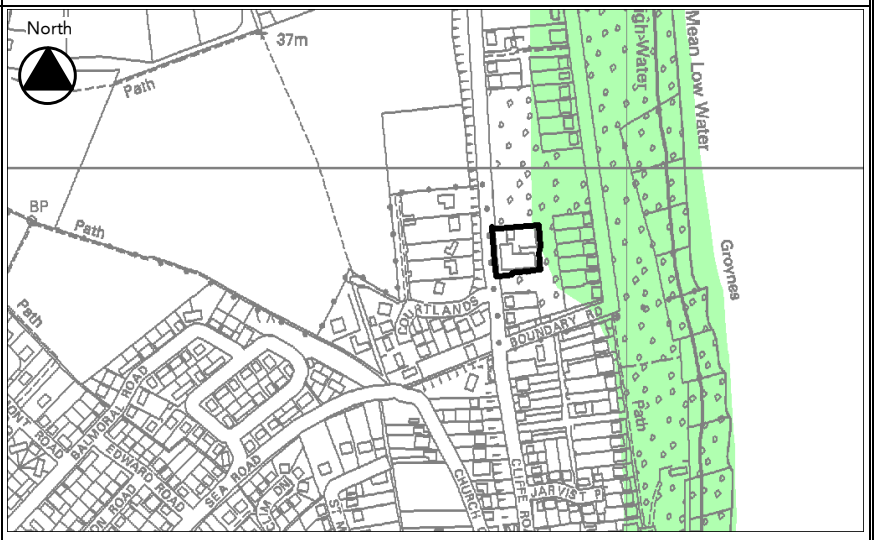
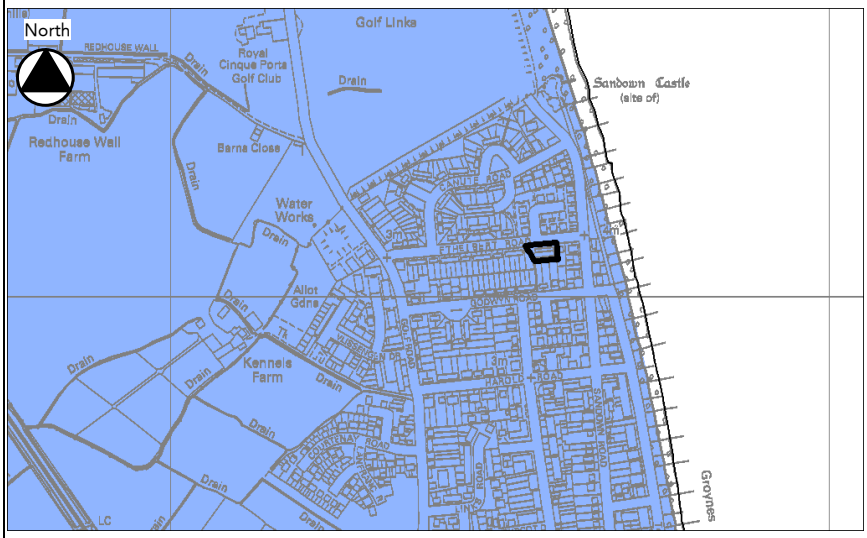
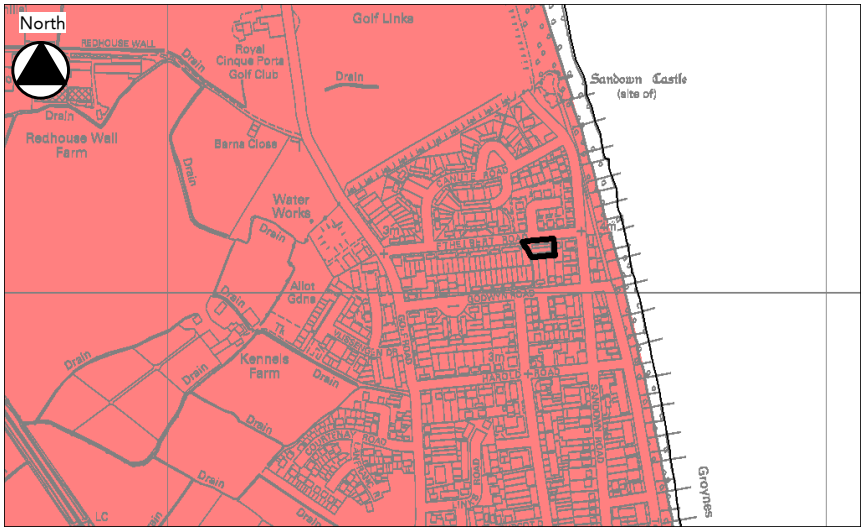
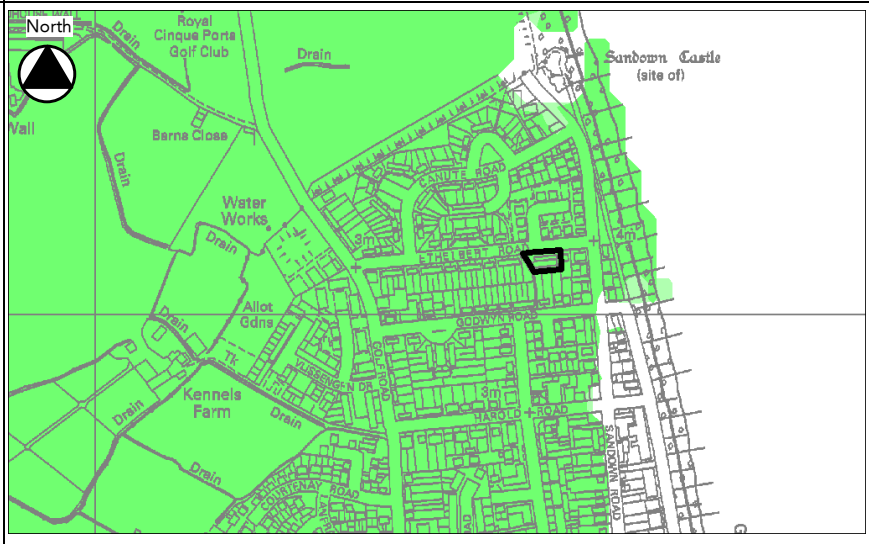
Site: Option:	SA – Garage site, Kingsdown Road 2 (also identified in option 1)
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology - Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No
Likelihood of passing Test:	N/A
Flood risk type and location:	Not affected by breach or overtopping scenarios
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Overtopping /Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Range of Modelled Flood Depths (m): Range of Modelled Flood Velocities (m/s): Time to inundations from point of overtopping or breach (hrs): In RIZ?	N/A
Mitigation Measures:	See section 5.7
Recommendations:	Even taking climate change into account only a very small area of the site is affected. Therefore, it may be beneficial to adjust the site boundary slightly. Although the site boundary does not lie within the beach/overtopping envelope, it was considered that the proximity of the site to breach envelope should be shown, in case the site boundary is adjusted in the future. Additionally, the site specific FRA will need to undertake a more detailed breach/overtopping analyses and following this, the site may be affected.

Table 5-17 Development site at Ethelbert Road

Site: **Option:**	**UC/PDL – Garage Block, Ethelbert Road** **1**
OS NGR:	TR 3756 5406
Size (ha):	0.1
Number of Dwellings:	6
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Concrete sea wall, groynes and secondary splash wall from Sandown Castle to 200m South of Pier
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Chalk Soil – Deep silty

Site: Option:	UC/PDL – Garage Block, Ethelbert Road 1
and site characteristics):	
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low
Flood risk type and location:	Breach of the coastal defence north of Sandown Castle. The site also lies within the area vulnerable to flooding within Deal that is affected by other sources of flooding. Therefore, this site is also at risk of flooding from intense rainfall and/or wave spay.
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Overtopping /Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Indicative range of Modelled Flood Depths (m):	0.8 – 1.3
Indicative range of Modelled Flood Velocities (m/s):	0.5 – 0.8
Time to inundations from point of overtopping or breach (hrs):	0.5
In RIZ?	Yes - Depth after 0.5 hrs: 0.6 – 1.2 Velocity after 0.5 hrs: 0.6 – 1.0

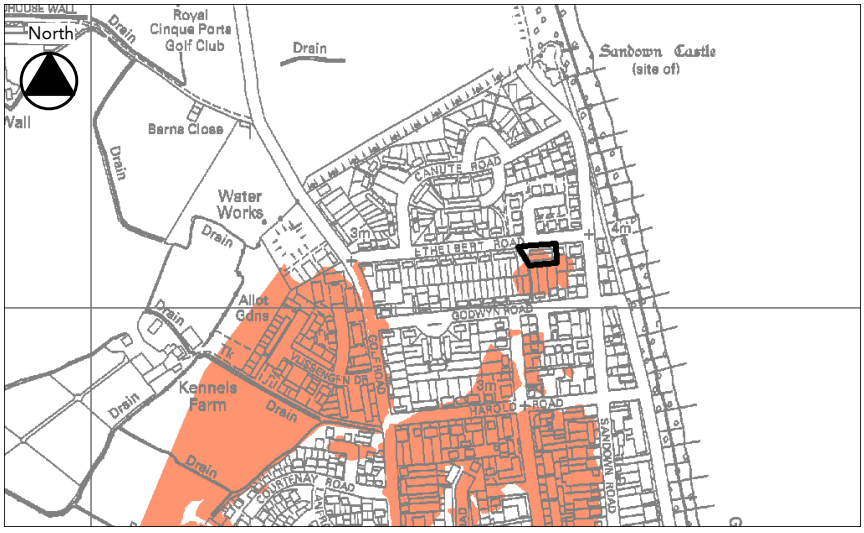
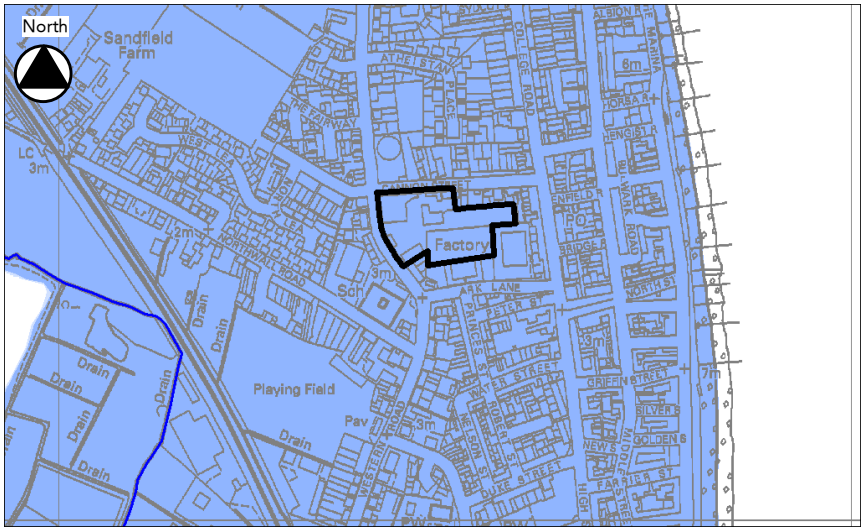
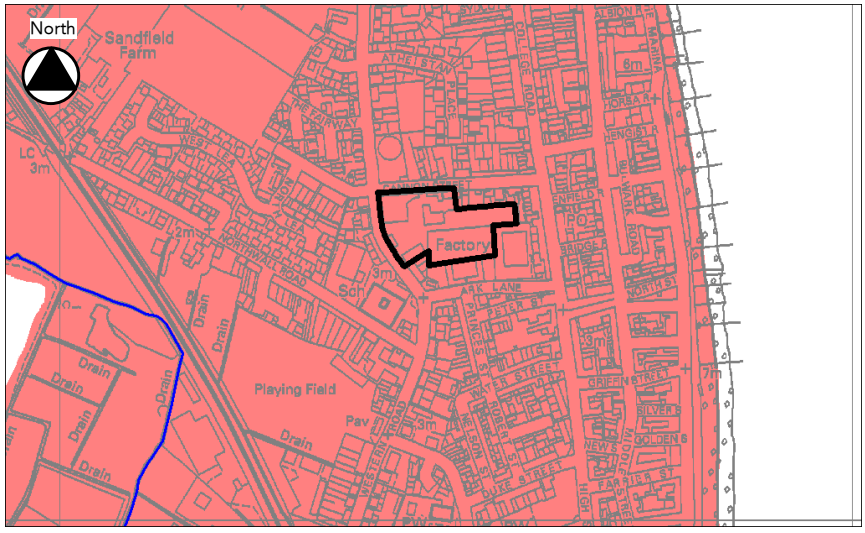
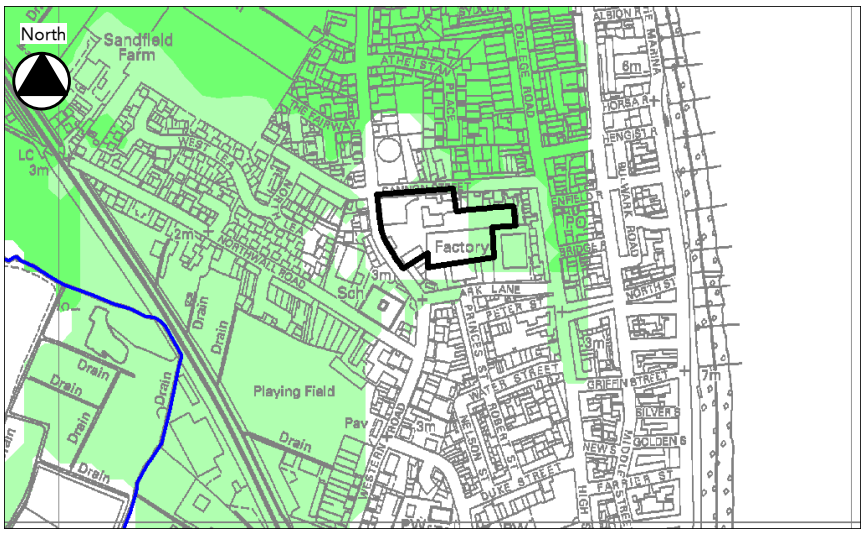
Site: Option:	UC/PDL – Garage Block, Ethelbert Road 1
Area vulnerable to flooding from other sources within Deal:	
Mitigation Measures:	Mitigation is not an option for this site, as the flood risk to too extreme
Recommendations:	***Alternative sites must be sought in lower flood risk areas.***

Table 5-18 Development sites at Cannon Street and Ark Lane

Site: **Option:**	**LDF/PD – Cannon Street** **1**
OS NGR:	TR 3748 5335
Size (ha):	1.17 (Cannon Street)
Number of Dwellings:	20 (Cannon Street)
Planning Permission Granted?	Cannon Street – No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Concrete sea wall, groynes and secondary splash wall from Sandown Castle to 200m South of Pier
Historical flooding / Drainage on site:	Deep flooding recorded to the road north of the site (Athelstan Place) in the storms of January 1978, as a result of sea water crashing over the defences.
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Chalk Soil – Deep silty

Site: Option:	LDF/PD – Cannon Street 1
and site characteristics):	
Indicative suitability for SUDS:	Low/Medium - see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low
Flood risk type and location:	Breach of the coastal defence north of Sandown Castle. The site also lies within the area vulnerable to flooding within Deal that is affected by other sources of flooding. Therefore, this site is also at risk of flooding from intense rainfall and/or wave spay.
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Overtopping /Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Indicative range of Modelled Flood Depths (m):	0.1 – 0.8
Indicative range of Modelled Flood Velocities (m/s):	0.1 – 0.3
Time to inundations from point of overtopping or breach (hrs):	0.5, but depths of flooding do not fall within the RIZ.
In RIZ?	No

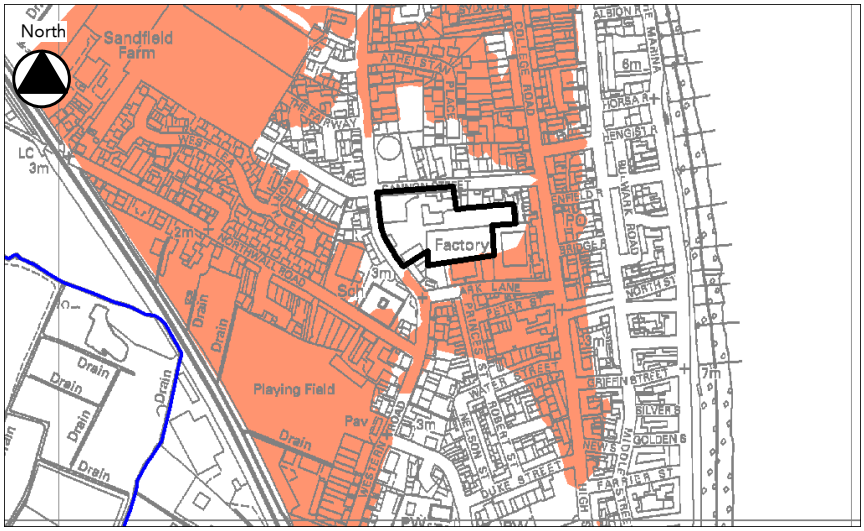
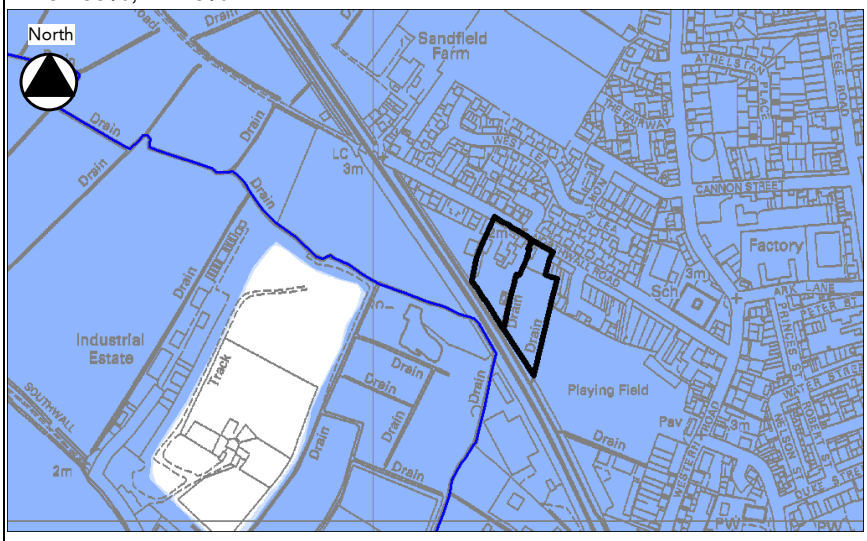
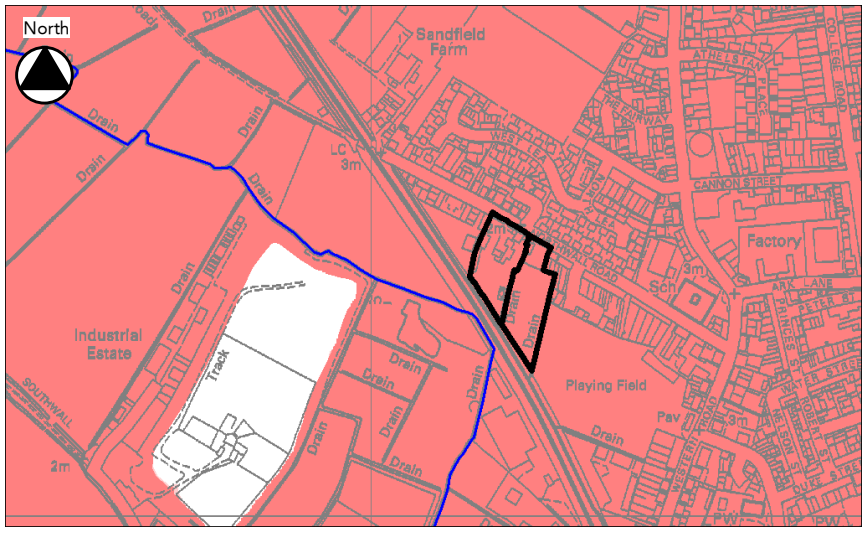
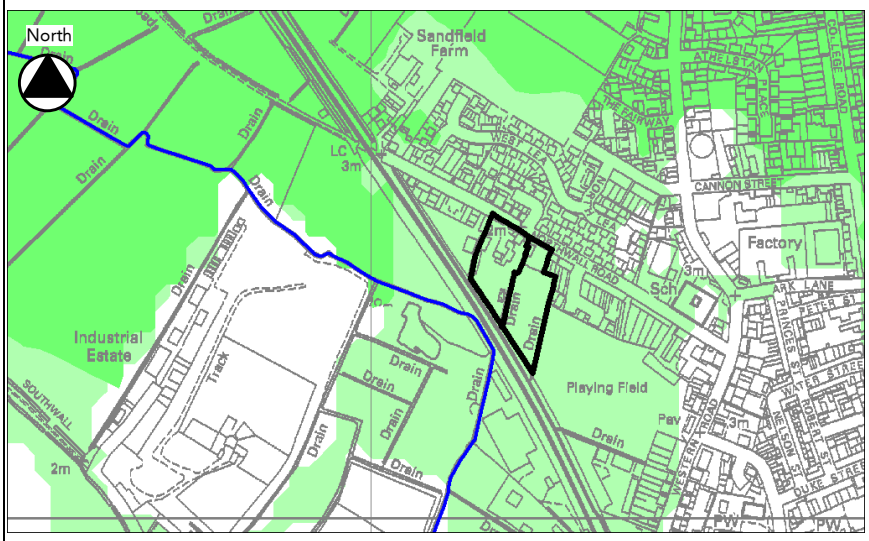
Site: **Option:**	**LDF/PD – Cannon Street** **1**
Area vulnerable to flooding from other sources within Deal:	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Mitigation Measures:	Mitigation is likely to be unfeasible. See section 5.7
Recommendations:	Little flood warning time, increasing risk. Environment Agency Flood Warning is currently 2 hours. A more detailed FRA may show that the site lies within the RIZ. The main concern that would need to be addressed with this site is safe access and egress. ***Alternative sites should be explored in lower flood risk areas.***

Table 5-19 Development sites at Northwell Road

Site: **Option:**	**040261 – 89 Northwall Road** **LPA – Northwall Road** **(2 separate sites)** **1**
OS NGR:	TR 3717 5329
Size (ha):	0.56 (89 Northwall Road) 0.61 (Northwall Road)
Number of Dwellings:	19 (89 Northwall Road) 14 (Northwall Road)
Planning Permission Granted?	89 Northwall Road – Yes Northwall Road - No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – Penfield Sewer

Site: **Option:**	**040261 – 89 Northwall Road** **LPA – Northwall Road** **(2 separate sites)** **1**
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Concrete sea wall, groynes and secondary splash wall from Sandown Castle to 200m South of Pier Fluvial - none
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Deep silty
Indicative suitability for SUDS:	Low/Medium - see section 5.8
Brown / Greenfield:	Brownfield and Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low
Flood risk type and location:	Breach of the coastal defence north of Sandown Castle. The site also lies within the area of flooding within Deal that is affected by other sources of flooding. Therefore, the site will also be a risk of flooding from intense rainfall and/or wave spay.
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Overtopping /Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Range of Modelled Flood Depths (m):	0.3 – 0.9
Range of Modelled Flood Velocities (m/s):	0.4 – 0.8
Time to inundations from point of overtopping or breach (hrs):	1
In RIZ?	No

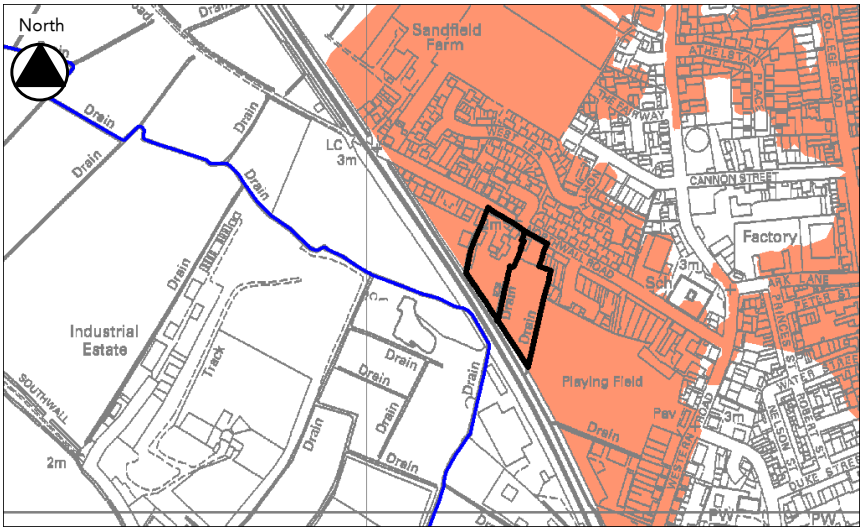
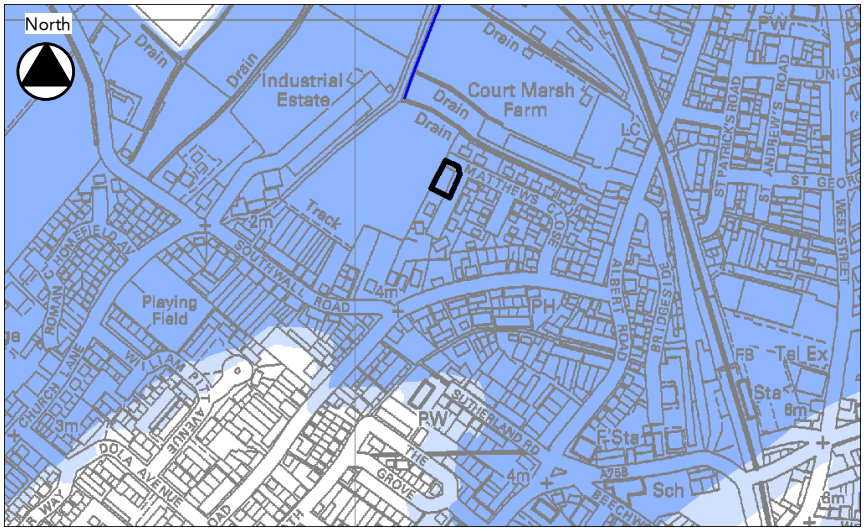
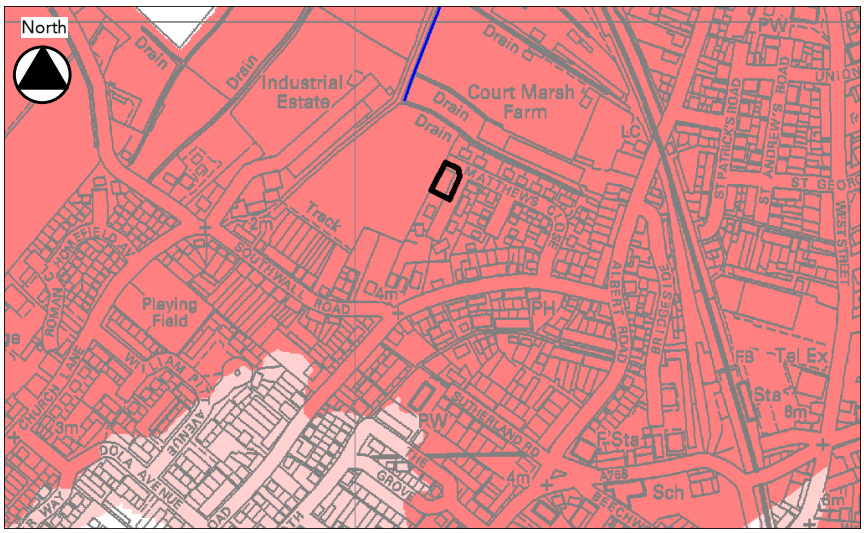
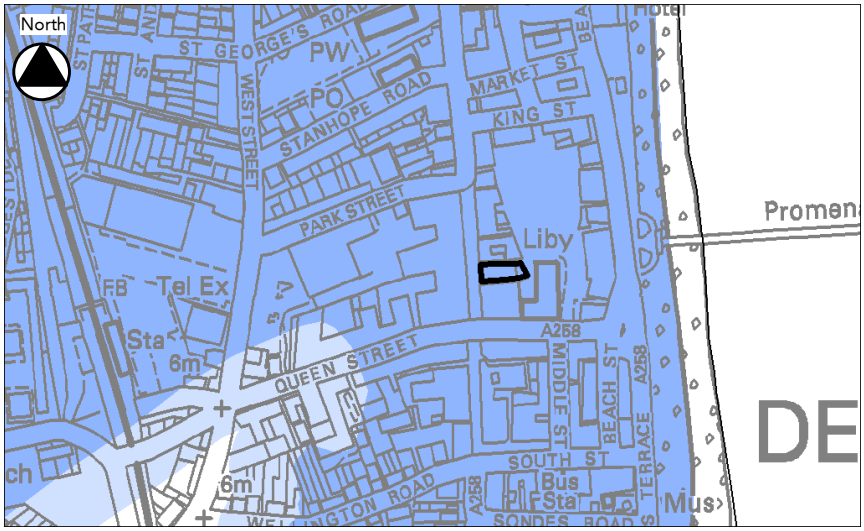
Site: **Option:**	**040261 – 89 Northwall Road** **LPA – Northwall Road** **(2 separate sites)** **1**
Area vulnerable to flooding from other sources within Deal:	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Mitigation Measures:	Mitigation is likely to be unfeasible. See section 5.7
Recommendations:	Little flood warning time, increasing risk. Environment Agency Flood Warning is currently 2 hours. A more detailed FRA may show that the site lies within the RIZ. Additionally, part of the site also lies within the Deal other sources flood zone, and the site could be cut off, with no dry access. ***Alternative sites must be sought in lower flood risk areas.***

Table 5-20 Development site adjacent to Matthews Close

Site: **Option:**	**880485 – Adjacent Matthews Close** **1**
OS NGR:	TR 3709 5282
Size (ha):	0.07
Number of Dwellings:	3
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – Penfield Sewer
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Concrete sea wall, groynes and secondary splash wall from Sandown Castle to 200m South of Pier Fluvial - none
Historical flooding / Drainage on site:	No information available

Site: **Option:**	**880485 – Adjacent Matthews Close** **1**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Deep Silty
Indicative suitability for SUDS:	Low/Medium - see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to High
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	The fluvial risk from the Penfield Sewer needs to be assessed in the site specific FRA. As the site is Greenfield, all additional surface water/runoff needs to be managed. Floor levels and flood compensation may be necessary, but this will need to be assessed following the FRA and in discussion with the Environment Agency.

Table 5-21 Development site at 36 High Street

Site: **Option:**	**980755 – 36 High Street (Formerly Black Horse PH)** **1**
OS NGR:	TR 3771 5265
Size (ha):	0.04
Number of Dwellings:	8
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Concrete sea wall, groynes and secondary splash wall from Sandown Castle to 200m South of Pier
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Chalk

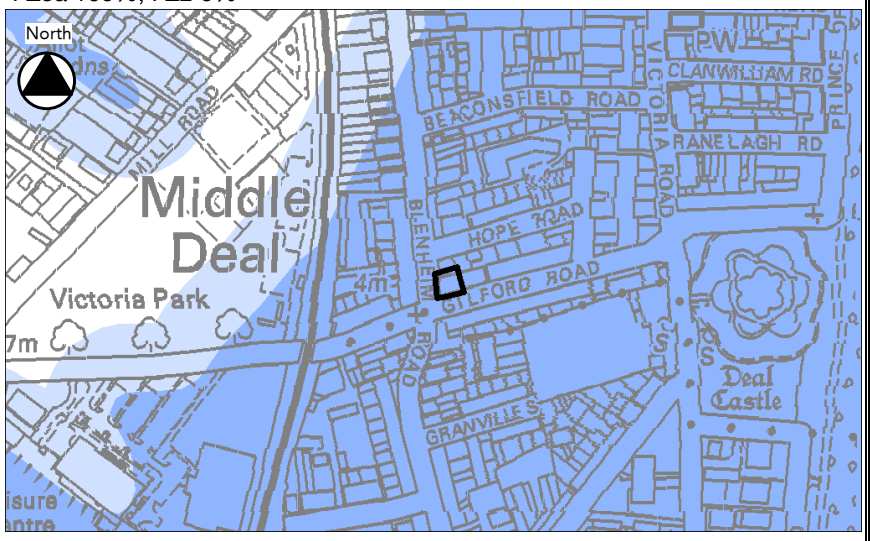
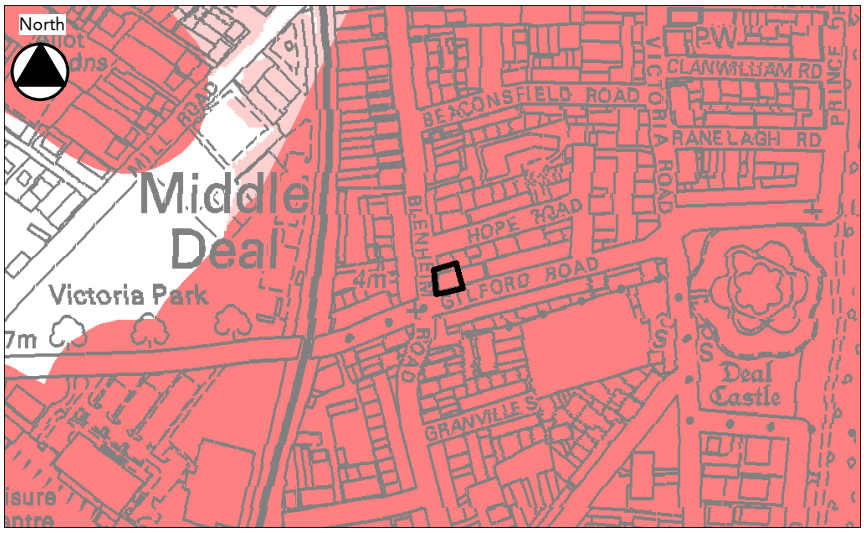
Site: **Option:**	**980755 – 36 High Street (Formerly Black Horse PH)** **1**
and site characteristics):	Soil – Deep Silty
Indicative suitability for SUDS:	Low/Medium - see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low to medium
Flood risk type and location:	Not affected by breach or overtopping scenarios. However, the site lies within the area of flooding within Deal that is affected by other sources of flooding. Therefore, this sites main flood risk will result from intense rainfall and/or wave spay.
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Area vulnerable to flooding from other sources within Deal:	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Mitigation Measures:	See section 5.7
Recommendations:	It is recommended that the site boundary be adjusted, or alternatively ground raising will be required, particularly where the site lies within the Deal Other sources flood zone. A site specific flood risk assessment will be required. ***Alternative sites should be explored in lower flood risk areas.***

Table 5-22 Development site at Sondes Road

Site: **Option:**	**041169 – 20-22 Sondes Road** **1**
OS NGR:	TR 3779 5244
Size (ha):	0.01
Number of Dwellings:	9
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Natural shingle ridge and embankment between 200m South of Pier and Kingsdown
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Chalk

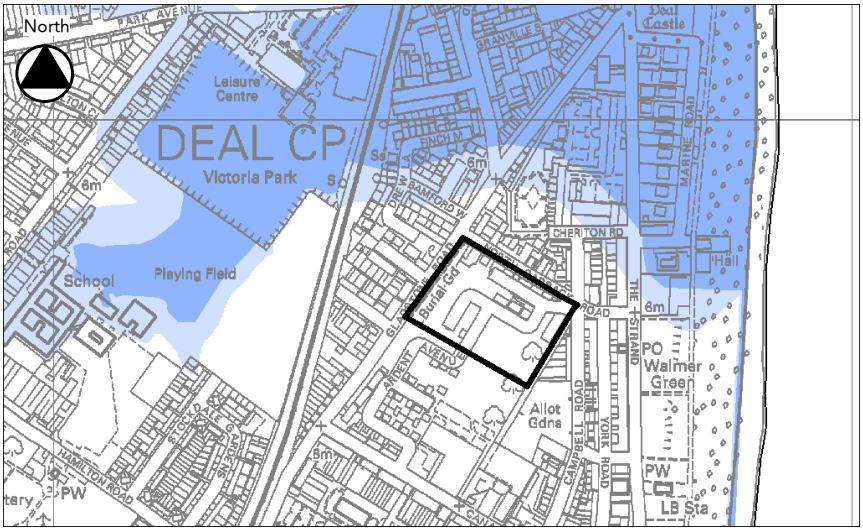
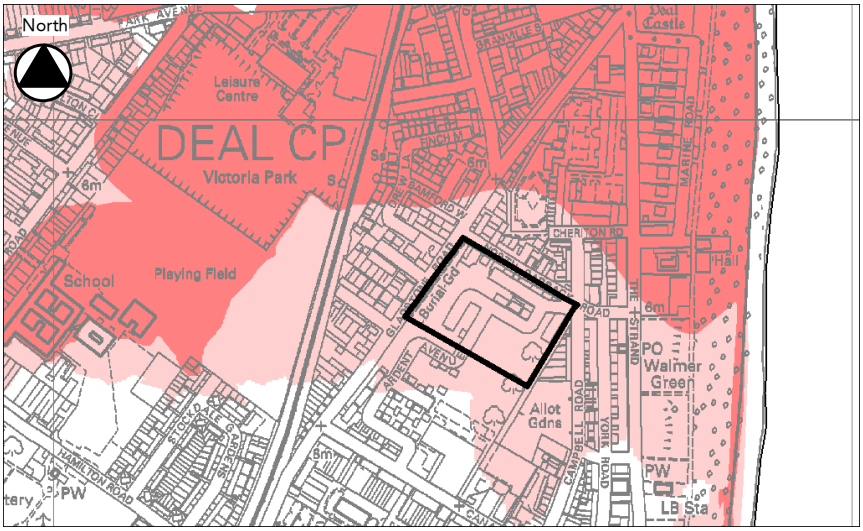
Site: **Option:**	**041169 – 20-22 Sondes Road** **1**
and site characteristics):	Soil – Deep Silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Brownfield
Located in source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone. Due to the lack of secondary defences between 200m South of Pier and Kingsdown, risk of defence breaching and flooding is highest in this zone, although breach modelling has shown that this site should not be affected.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to High
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	A site specific FRA will be required. Raising of floor levels and flood compensation may be necessary, but this will need to be assessed during a detailed the FRA and through discussion with the Environment Agency.

Table 5-23 Development site at Gilford Road

Site: **Option:**	**030487 – 40-42 land to the right of Gilford Road** **1**
OS NGR:	TR 3754 5220
Size (ha):	0.03
Number of Dwellings:	5
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Natural shingle ridge and embankment between 200m South of Pier and Kingsdown
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map	Geology – Chalk

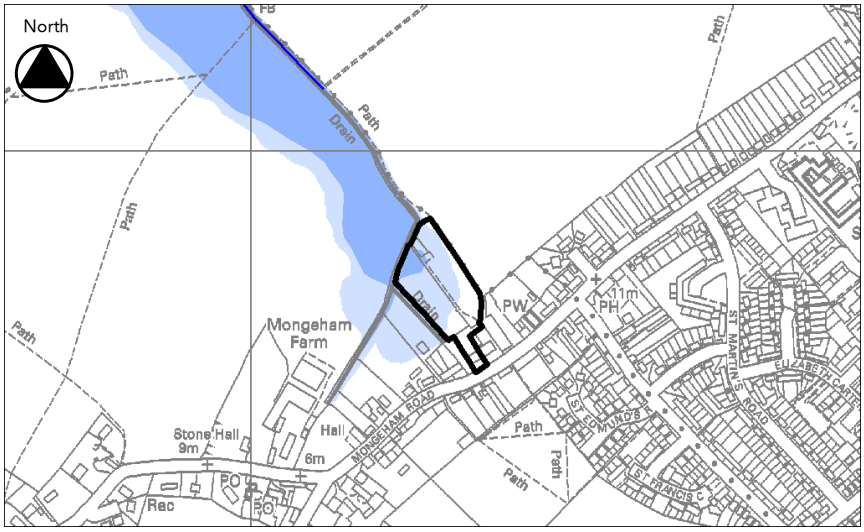
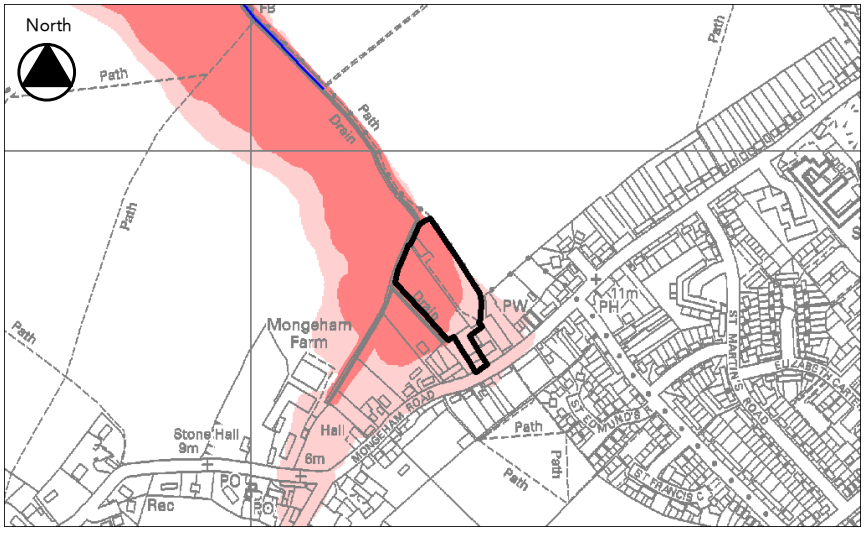
Site: **Option:**	**030487 – 40-42 land to the right of Gilford Road** **1**
symbol and subgroup / Soil and site characteristics):	Soil – Deep Silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone. Due to the lack of secondary defences between 200m South of Pier and Kingsdown, risk of defence breaching and flooding is highest in this zone, although breach modelling has shown that this site should not be affected.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to High
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	A site specific FRA will be required. Raising of floor levels and flood compensation may be necessary, but this will need to be assessed during a detailed the FRA and through discussion with the Environment Agency.

Table 5-24 Development site at R M Barracks

Site: **Option:**	**000653 – R M Barracks, Gladstone Road/North Barrack Road** **1**
OS NGR:	TR 3754 5172
Size (ha):	2.04
Number of Dwellings:	8
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	Site lies outside of FZ3 and FZ2 - FZ1 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 0%, FZ2 CC 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Natural shingle ridge and embankment between 200m South of Pier and Kingsdown
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Chalk

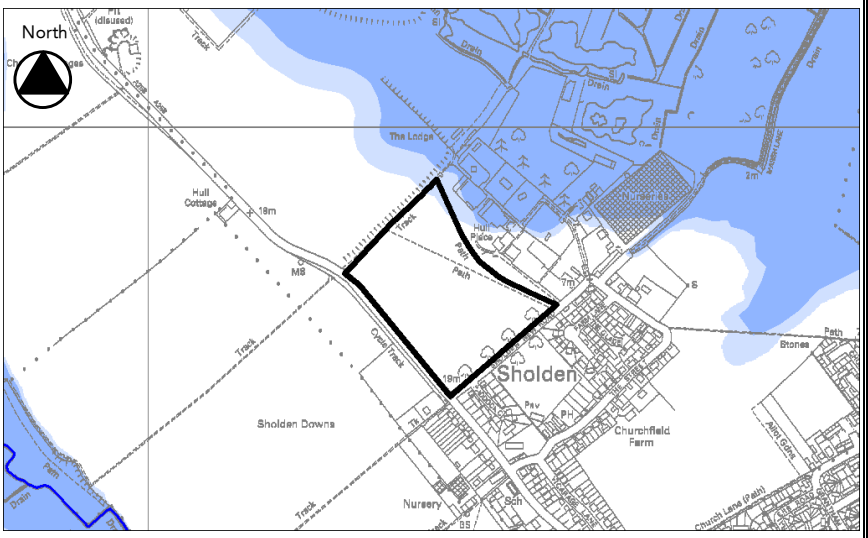
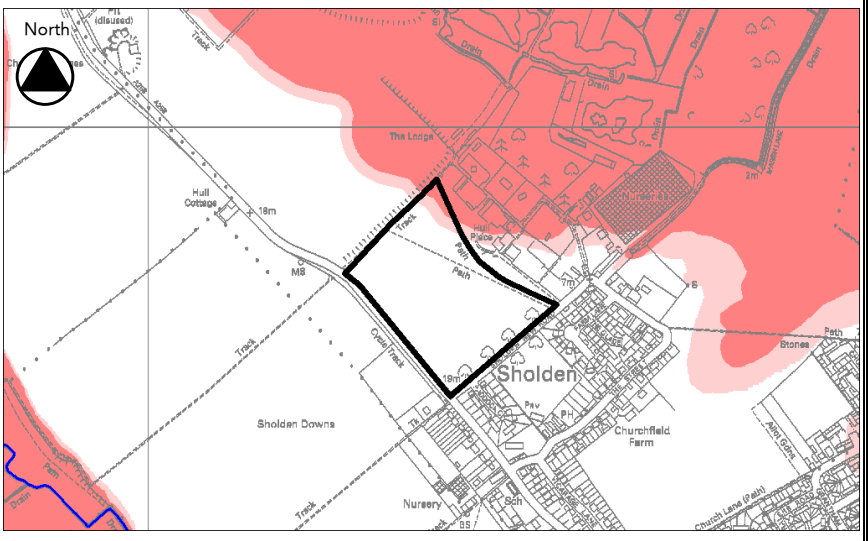
Site: **Option:**	**000653 – R M Barracks, Gladstone Road/North Barrack Road** **1**
and site characteristics):	Soil – Deep Silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Brownfield and Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None Due to the lack of secondary defences between 200m South of Pier and Kingsdown, risk of defence breaching and flooding is highest in this zone, although breach modelling has shown that this site should not be affected.
Exception Testing	
Exception Test Applicable?	No
Likelihood of passing Test:	N/A
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	A site specific FRA will be required. As the site is shown only to lie with FZ2 when making allowance for climate change, mitigation requirements will need to be discussed with the Environment Agency.

Table 5-25 Development site at Mongeham road

Site: **Option:**	**LDF/PD – Stalco Engineering, 126 Mongeham Road** **1**
OS NGR:	TR 3523 5183
Size (ha):	1.02
Number of Dwellings:	36
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 5%, FZ2 70%, FZ1 25%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 68%, FZ2 CC 32%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – South Stream
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Natural shingle ridge and embankment between 200m South of Pier and Kingsdown Fluvial - none
Historical flooding /	No information available

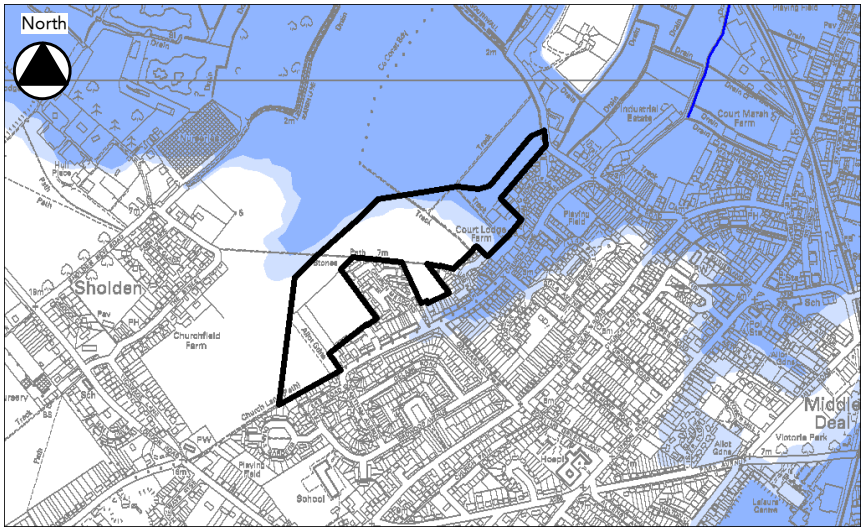
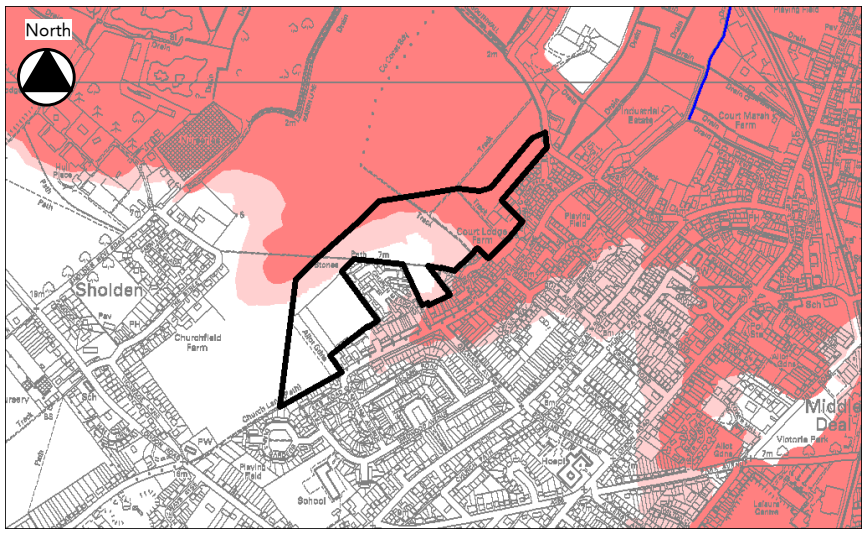
Site: **Option:**	**LDF/PD – Stalco Engineering, 126 Mongeham Road** **1**
Drainage on site:	
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Silty over chalk
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: North and South Streams
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to High
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	A site specific FRA will be required that takes into account both tidal and fluvial risk (from the South Stream). It must be demonstrated that all surface water/runoff from the site will be managed. Land raising and/or flood compensation may be necessary.

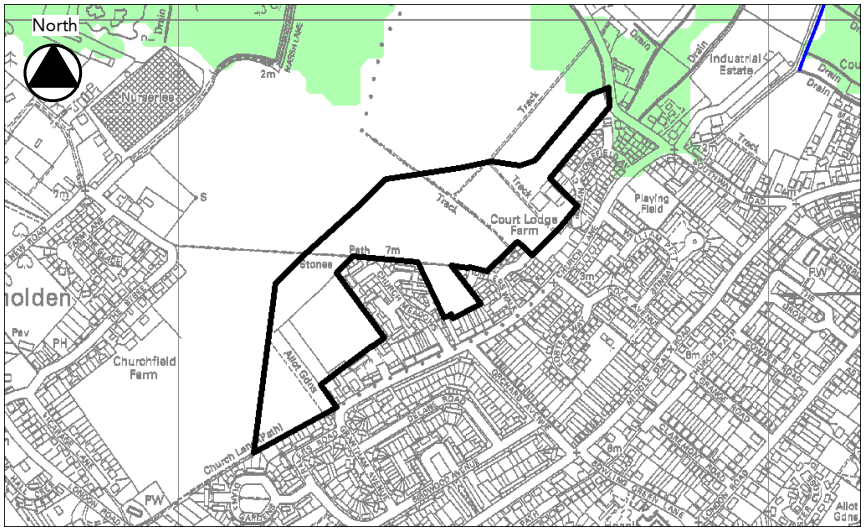
Table 5-26 Development site near Sholden

Site: **Option:**	**SA15 – Land to the northwest of Sholden** **2**
OS NGR:	TR 3555 5269
Size (ha):	7.19
Number of Dwellings:	200
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 0%, FZ2 2%, FZ 1 98%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 2%, FZ2 CC 3%, FZ1 95%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Chalk Soil – Silty over chalk

Site: **Option:**	**SA15 – Land to the northwest of Sholden** **2**
and site characteristics):	
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No
Likelihood of passing Test:	N/A
Flood risk type and location:	Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	N/A
Range of Modelled Flood Velocities (m/s):	
Time to inundations from point of overtopping or breach (hrs):	
In RIZ?	
Mitigation Measures:	See section 5.7
Recommendations:	A site specific FRA will be required, and it must be demonstrated that surface water/runoff will be managed. As only a very small part of the site is shown to be at flood risk, it is recommended that the boundary be adjusted slightly.

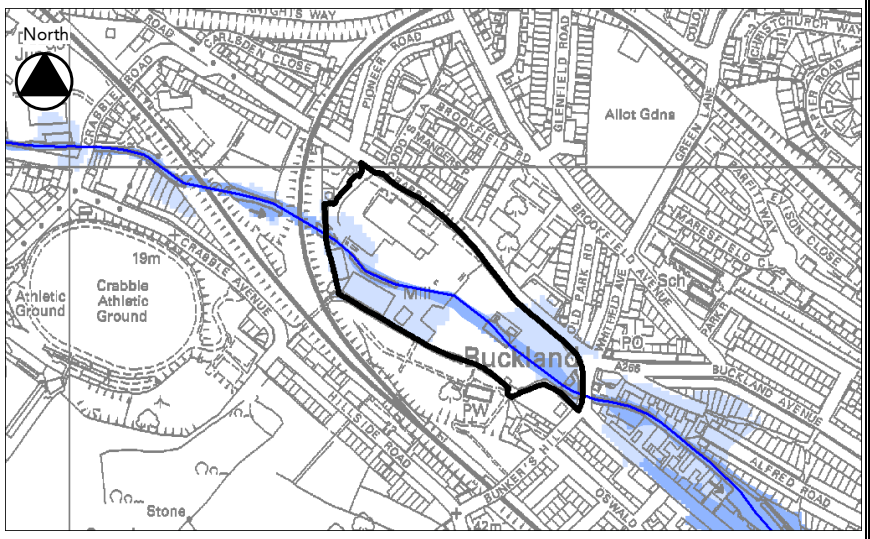
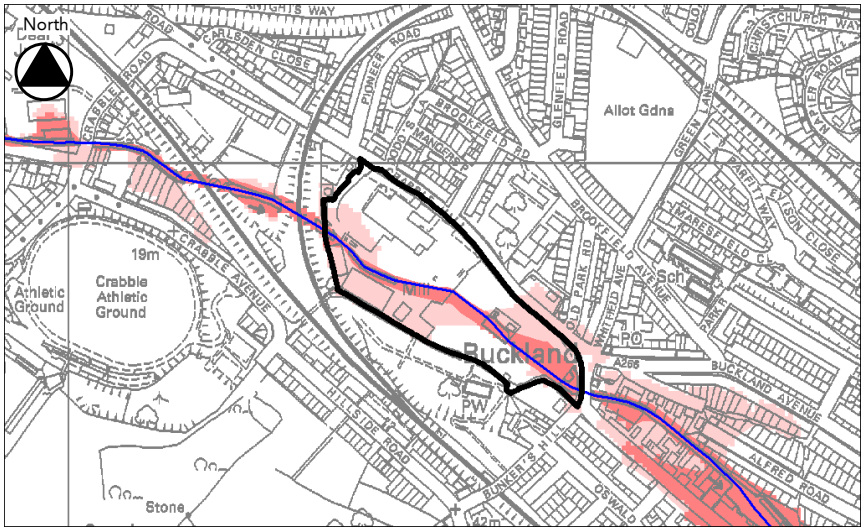
Table 5-27 Development site between Deal and Sholden

Site: **Option:**	**SA16 – Land between Deal and Sholden** **3**
OS NGR:	TR 3635 5263
Size (ha):	10.53
Number of Dwellings:	290
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 18%, FZ2 10%, FZ1 72%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 29%, FZ2 CC 28%, FZ1 43%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial, from drainage network, in particular the Southwall drain
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Concrete sea wall, groynes and secondary splash wall from Sandown Castle to 200m South of Pier
Historical flooding / Drainage on site:	No information available

Site: Option:	SA16 – Land between Deal and Sholden 3
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology - Chalk Soil – Deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone Considered to lie within FZ3b, 'functional floodplain' of the Southwall Drain.
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to High
Flood risk type and location:	Not affected by breach or overtopping scenarios
Breach/Overtopping Coverage: *Legend:* Main River Development Site Maximum Overtopping /Breach Extent Rapid Inundation Zone	 *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Range of Modelled Flood Depths (m): Range of Modelled Flood Velocities (m/s): Time to inundations from point of overtopping or breach (hrs): In RIZ?	N/A
Mitigation Measures:	See section 5.7
Recommendations:	Although the site boundary does not lie within the beach/overtopping envelope, it was considered that the proximity of the site to breach envelope should be shown, in case the site boundary is adjusted in the future. Additionally, the site specific FRA will need to undertake a more detailed breach analyses and following this, the site may be affected. A site-specific FRA will be required that takes account of both tidal and flood risk from the Penfield Sewer drainage system. Land raising and/or flood compensation may be necessary. Alternatively, based on the FRA the portion of the site not shown to be at risk of flooding should be explored for development only and a suitable minimum land level for development be agreed with the Environment Agency.

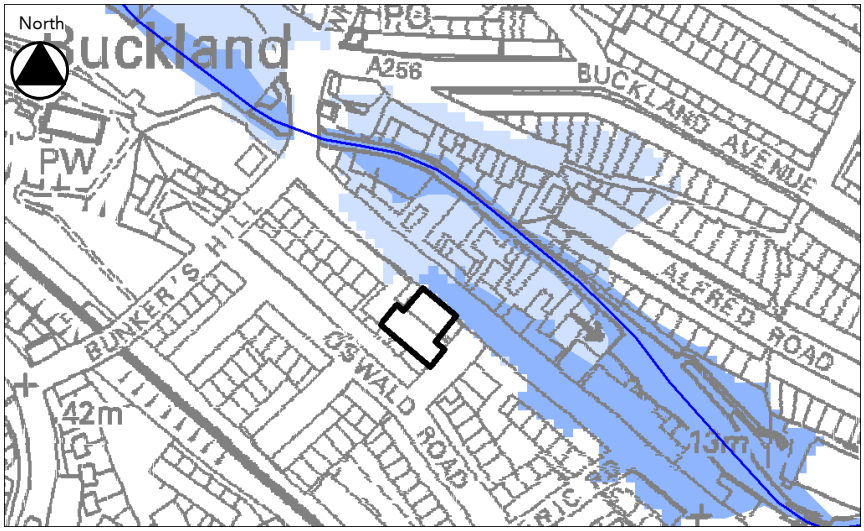
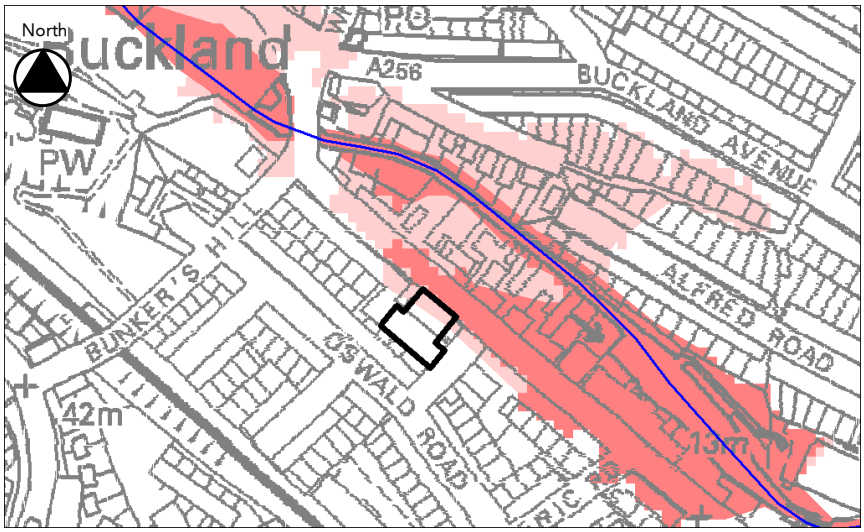
5.4.3 Dover area

Table 5-28 Development site at Buckland paper Mill

Site: **Option:**	**LDF/PD – Buckland Paper Mill, London Road** **1**
OS NGR:	TR 3043 4286
Size (ha):	3.98
Number of Dwellings:	300
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 14%, FZ2 29%, FZ1 57%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 17%, FZ2 CC 30%, FZ1 53%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	Areas around Buckland flooded in September 2003 due to heavy rainfall coinciding with a high tide meaning the Dour could not outflow into the sea.

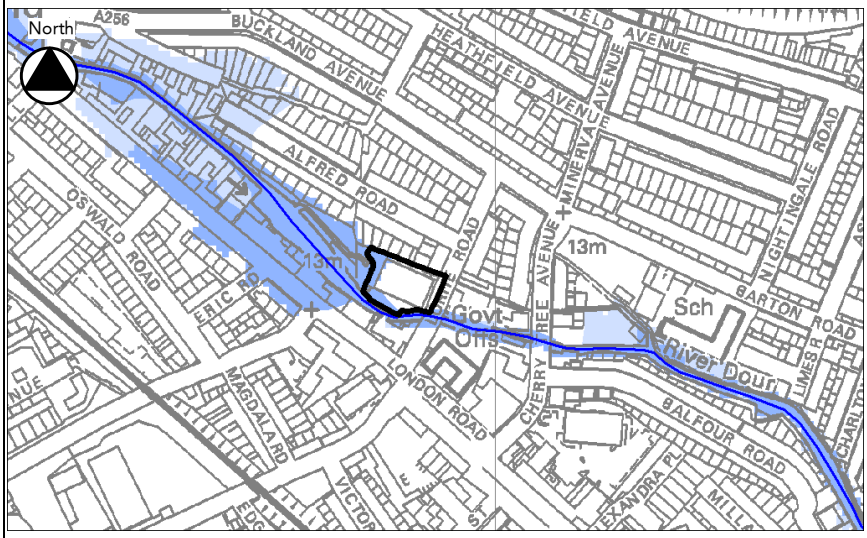
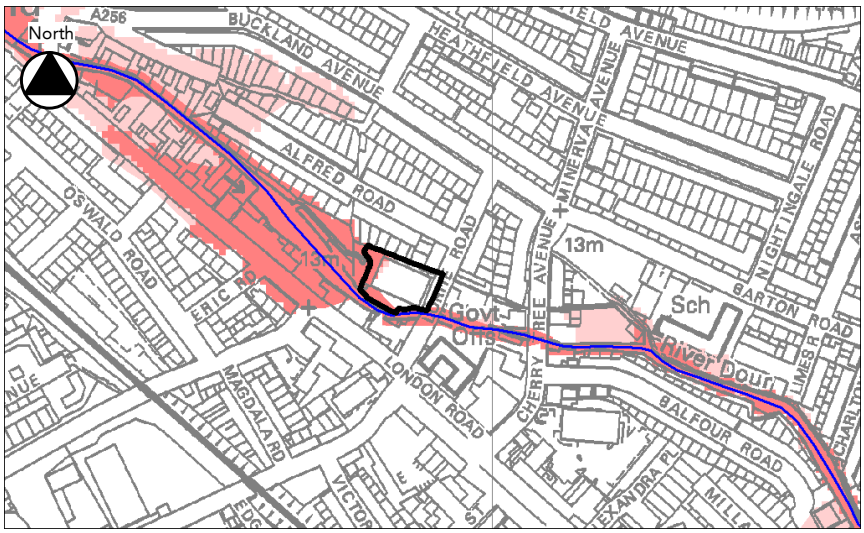
Site: **Option:**	**LDF/PD – Buckland Paper Mill, London Road** **1**
	(Source: www.dover.gov.uk)
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	Yes – Source Protection Zone 1
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Instead of seeking other sites for the development, it may be more appropriate to set the boundary back from the river and/or to incorporate water compatible and/or open space areas into the development option. Land raising and flood compensation will be necessary.

Table 5-29 Development site at Churchill's Snooker Club

Site: **Option:**	**050659 – Churchill's Snooker Club, London Road** **1**
OS NGR:	TR 3068 4261
Size (ha):	0.09
Number of Dwellings:	10
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	Site lies outside FZ3 and FZ2 – FZ1 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 0%, FZ2 CC 22%, FZ1 78%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	Areas around London Road flooded in September 2003 due to heavy rainfall coinciding with a high tide meaning the Dour could not outflow into the sea. (Source: www.dover.gov.uk)
Soil map data (Geology / Map	Geology – Chalk

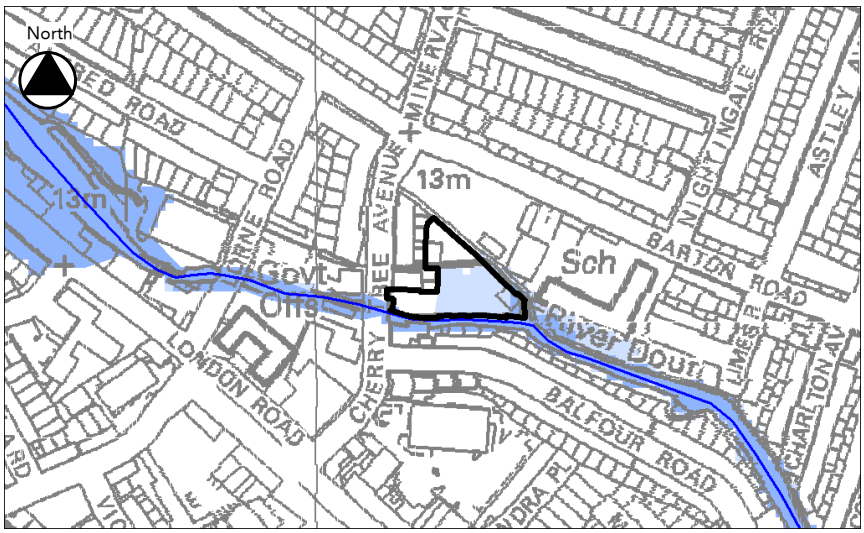
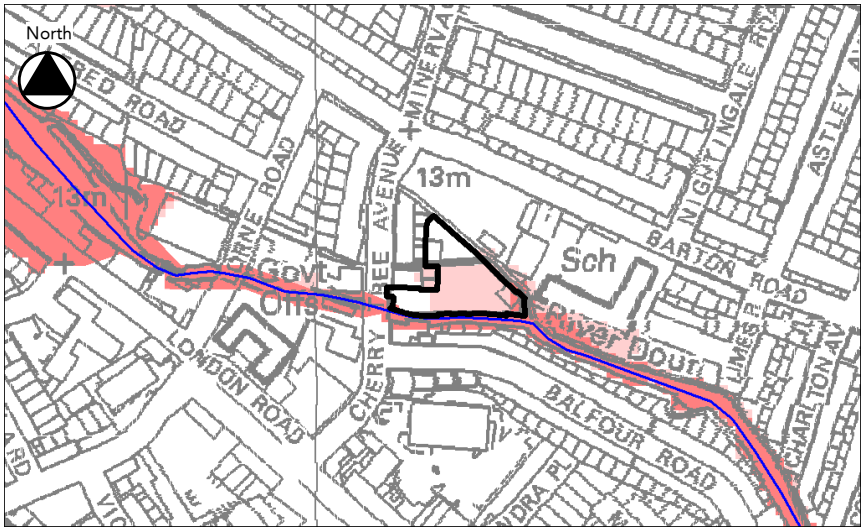
Site: **Option:**	**050659 – Churchill's Snooker Club, London Road** **1**
symbol and subgroup / Soil and site characteristics):	Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield and Greenfield
Located in Source Protection Zone?	Yes – Source Protection Zone 2
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No
Likelihood of passing Test:	N/A
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	More detailed assessment of the 1 in 100 year flood envelope will be required in the FRA for this site, as currently FZ3 borders the site. The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. It may be beneficial to adjust the site boundary.

Table 5-30 Development site at Lorne Road

Site: **Option:**	**PDL/UC – Factory building, Lorne Road** **1**
OS NGR:	TR 3091 4253
Size (ha):	0.25
Number of Dwellings:	17
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 24%, FZ2 0%, FZ1 76%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 24%, FZ2 CC 1%, FZ1 75%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	The Peter Brett Associates Dour Hydrology Report, March 2007, details flooding at Lorne Road. A date is not specified for this but it is believed to have occurred since 2002, and according to local residents such an event occurs “every couple of years.”

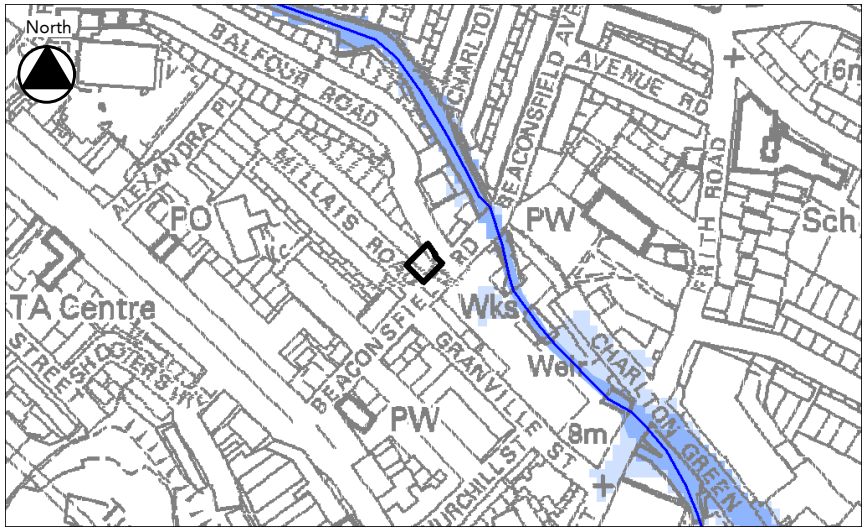
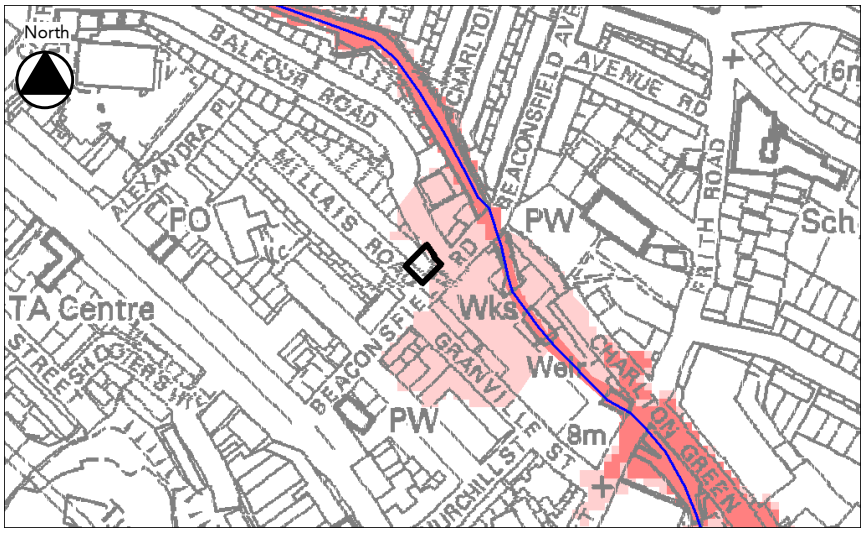
Site: **Option:**	**PDL/UC – Factory building, Lorne Road** **1**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	Yes – Source Protection Zone 2
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Although the flood zones are shown to only affect part of the site, there are site specific issues with Lorne Road in part due to the operation of the sluice gate controlling the Mill Leat Channel. The site is known historically to flood for much lower return periods than the 1 in 100yr event as a result of this. Additionally, the Environment Agency have confirmed that under normal flow conditions, the mill stream flows beneath this site and during flood conditions, causes flooding to the site, to Lorne Road, and downstream of he site. This is partially caused by the sluice at the mill. Improvements to the sluice gate may be an option, although mitigation measures may not be economically viable. ***Alternative sites should be explored in lower flood risk areas.***

Table 5-31 Development site at Cherry Tree Avenue

Site: **Option:**	**990415 – Land adjacent to and rear of 21 Cherry Tree Avenue** **1**
OS NGR:	TR 3109 4249
Size (ha):	0.25
Number of Dwellings:	10
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 5%, FZ2 51%, FZ1 44%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 5%, FZ2 CC 55%, FZ1 40%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Chalk

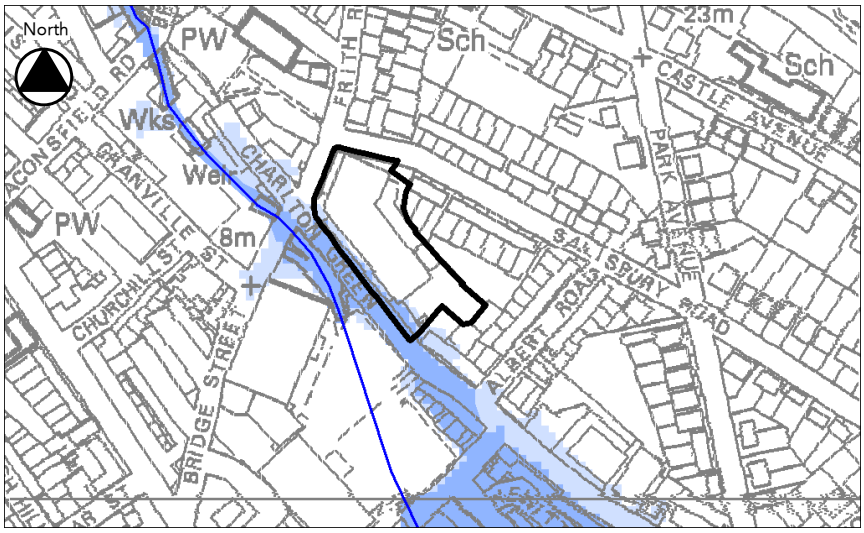
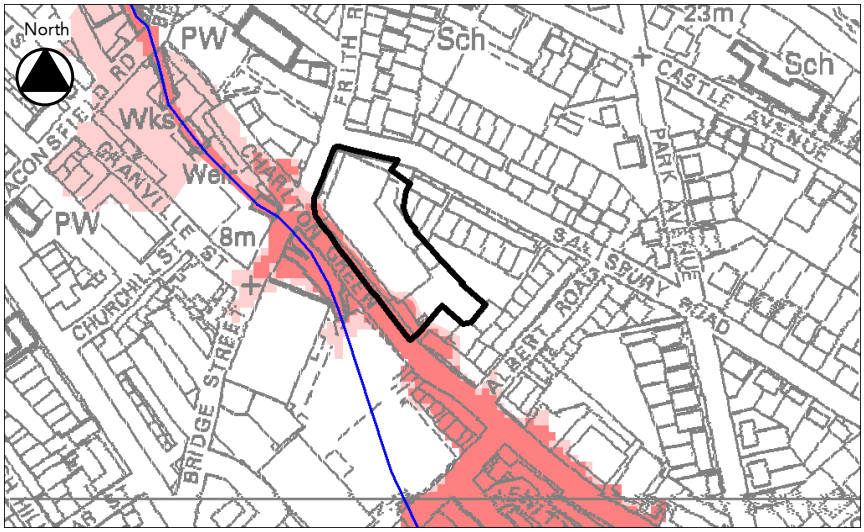
Site: **Option:**	**990415 – Land adjacent to and rear of 21 Cherry Tree Avenue** **1**
and site characteristics):	Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	Yes – Source Protection Zone 1
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Instead of seeking other sites for the development, it may be more appropriate to set the boundary back from the river and/or to incorporate water compatible and/or open space areas into the development option. Land raising and flood compensation will be necessary.

Table 5-32 Development site at Beaconsfield Road

Site: **Option:**	**031008 – Reliance Garage, Beaconsfield Road** **1**
OS NGR:	TR 3127 4228
Size (ha):	0.03
Number of Dwellings:	9
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	Site lies outside of FZ3 and FZ2 – FZ1 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 0%, FZ2 CC 13%, FZ1 87%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	The Kent Area PACS Manager reports flooding of rear gardens to properties in Balfour Road in February 2001. Also reports of flooding in Granville Street during 2003.
Soil map data (Geology / Map	Geology – Chalk

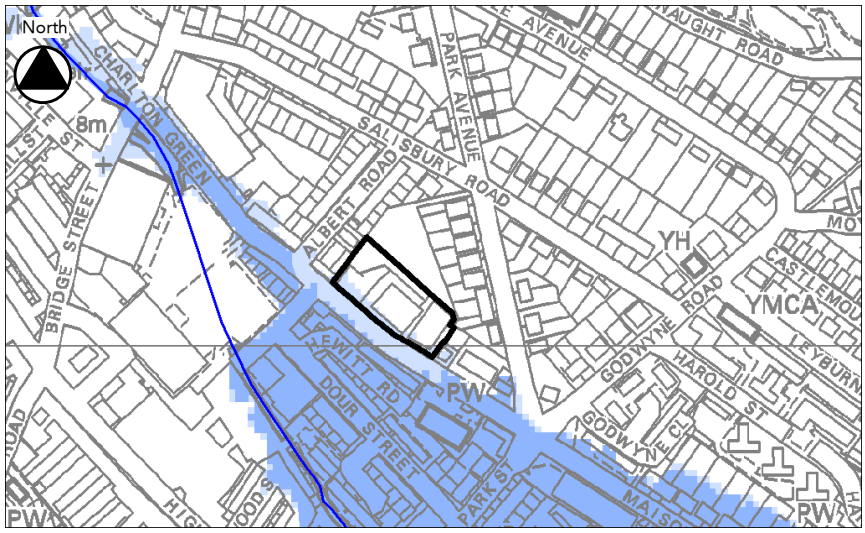
Site: **Option:**	**031008 – Reliance Garage, Beaconsfield Road** **1**
symbol and subgroup / Soil and site characteristics):	Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	Yes – Source Protection Zone 1
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No
Likelihood of passing Test:	N/A
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Historical flooding suggests that the broadscale modelled flood outlines may be underestimating flooding in this location. It is strongly recommended that a more detailed FRA is undertaken to accurately assess the flood risk ti this site. It may be beneficial to adjust the site boundary.

Table 5-33 Development site at Charlton Green, Frith Road and Maison Dieu Road

Site: **Option:**	**PDL/UC – Charlton Green Sorting Office, Frith Road & Maison Dieu Road** **1**
OS NGR:	TR 3147 4217
Size (ha):	0.69
Number of Dwellings:	34
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 9%, FZ2 5%, FZ1 86%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 14%, FZ2 CC 5%, FZ1 81%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	Areas around Maison Dieu Road flooded in September 2003 due to heavy rainfall coinciding with a high tide meaning the Dour could not outflow into the sea. (Source: www.dover.gov.uk)

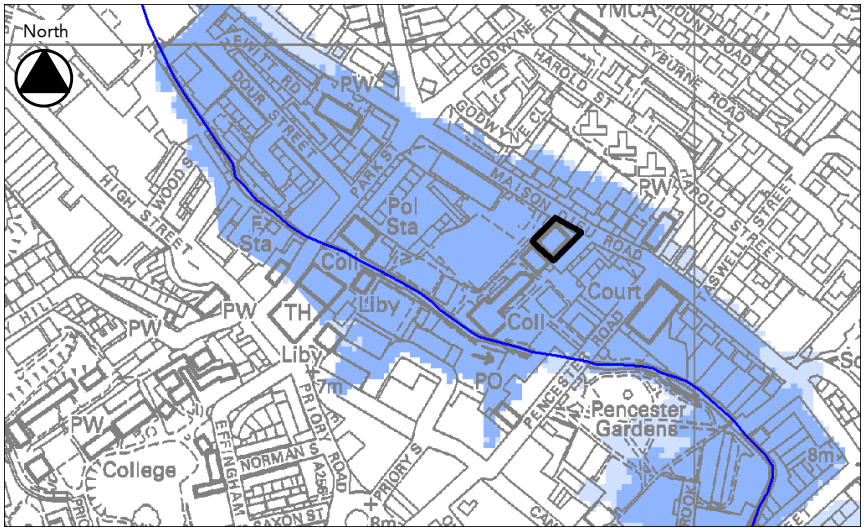
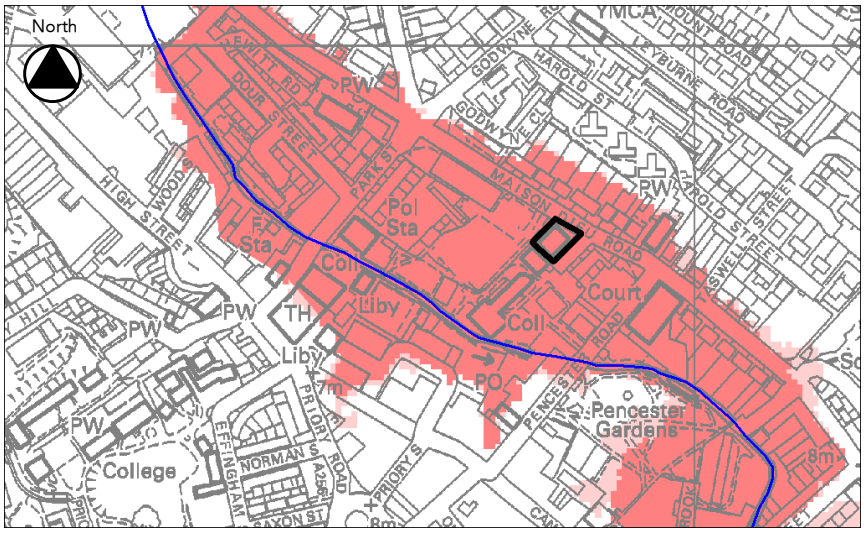
Site: **Option:**	**PDL/UC – Charlton Green Sorting Office, Frith Road & Maison Dieu Road** **1**
	Flooding also occurred along Maison Dieu Road during June 2007.
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	Yes – Source Protection Zone 1
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. It may be appropriate to move the site boundary.

Table 5-34 Development site at Maison Dieu Raod

Site: **Option:**	**PDL/UC – Eclipse Recovery Services and Sorting Office, Maison Dieu Road** **1**
OS NGR:	TR 3162 4203
Size (ha):	0.43
Number of Dwellings:	24
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 0%, FZ2 16%, FZ1 84%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 13%, FZ2 CC 6%, FZ1 81%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	Areas around Maison Dieu Road flooded in September 2003 due to heavy rainfall coinciding with a high tide meaning the Dour could not outflow into the sea. (Source: www.dover.gov.uk)

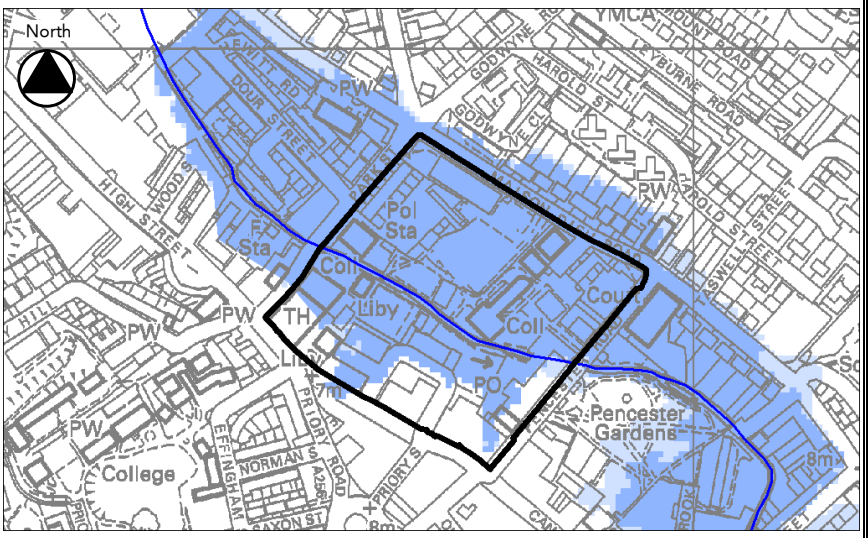
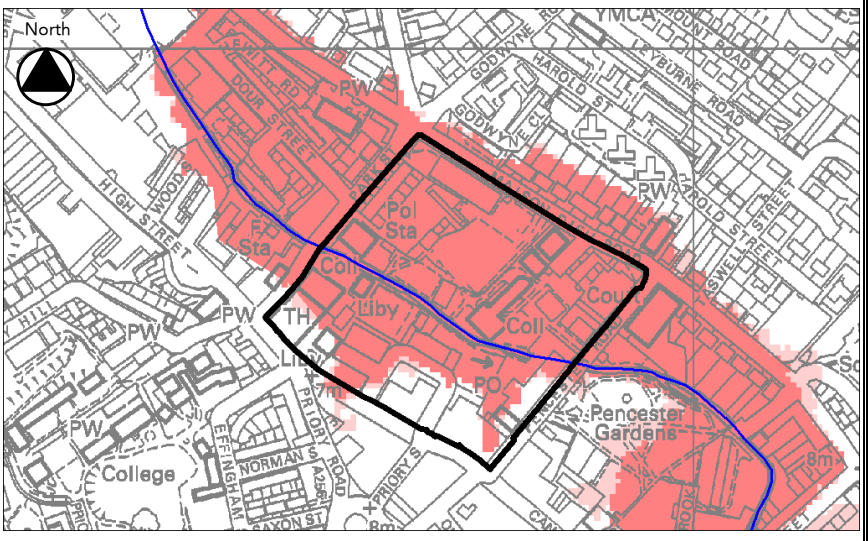
Site: **Option:**	**PDL/UC – Eclipse Recovery Services and Sorting Office, Maison Dieu Road** **1**
	Flooding also occurred along Maison Dieu Road during June 2007.
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	Yes – Source Protection Zone 1
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No
Likelihood of passing Test:	N/A
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. It may be appropriate to adjust the site boundary.

Table 5-35 Development site at The Paddock

Site: **Option:**	**030983 – Art School, The Paddock** **1**
OS NGR:	TR 3186 4181
Size (ha):	0.09
Number of Dwellings:	22
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	Areas around Maison Dieu Road flooded in September 2003 due to heavy rainfall coinciding with a high tide meaning the Dour could not outflow into the sea. (Source: www.dover.gov.uk). Fluvial flooding from the River Dour in June 2007.

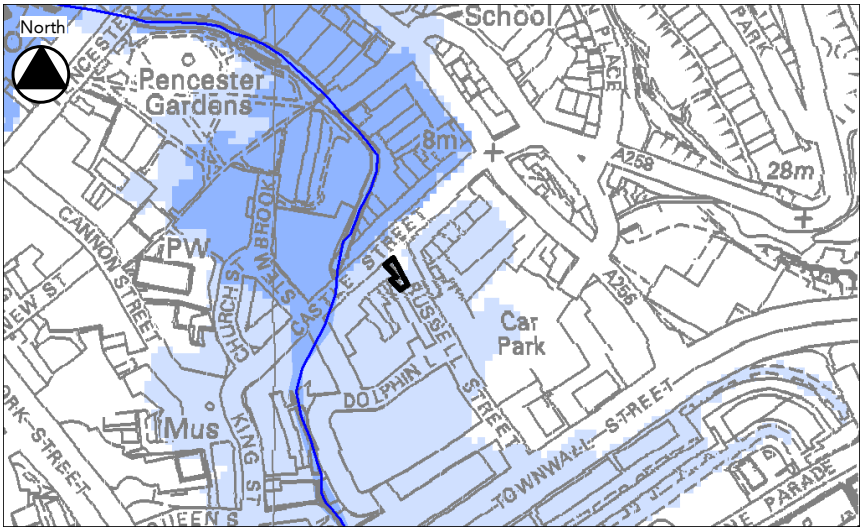
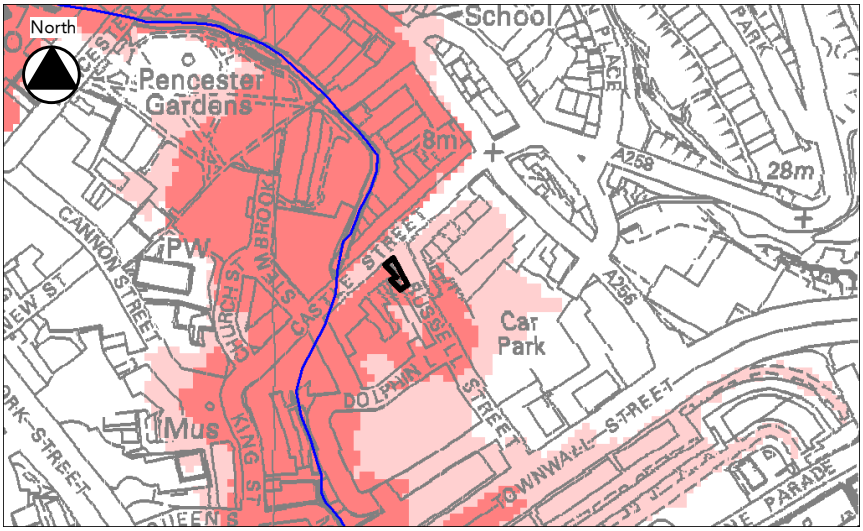
Site: **Option:**	**030983 – Art School, The Paddock** **1**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Land raising and flood compensation may not be viable for this development but should be discussed with the Environment Agency through the specific FRA. ***Alternative sites should be explored in lower flood risk areas.***

Table 5-36 Development site for the Mid Town Area

Site: **Option:**	**LDF/PD – Mid Town Area** **1**
OS NGR:	TR 3176 4178
Size (ha):	5.96
Number of Dwellings:	40
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 80%, FZ2 2%, FZ1 18%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:** Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 81%, FZ2 CC 2%, FZ1 17%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	During flooding in June 2007, fluvial flooding from the Dour occurred and surcharged drains at TR31754180 (within the site boundary) onto Maison Dieu Rd and College area.
Soil map data (Geology / Map	Geology – Chalk

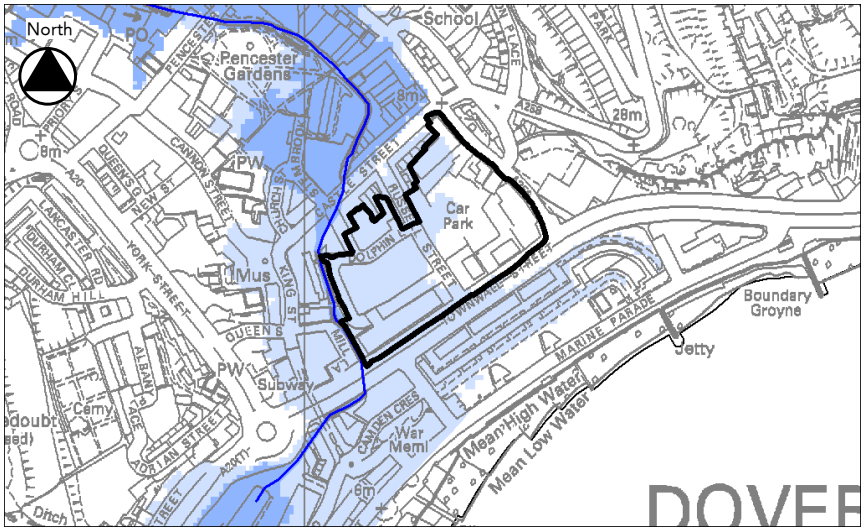
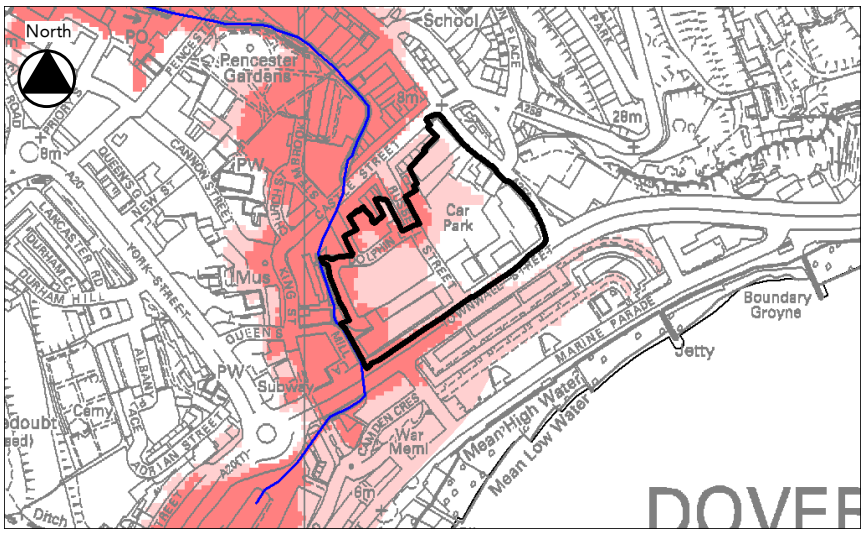
Site: **Option:**	**LDF/PD – Mid Town Area** **1**
symbol and subgroup / Soil and site characteristics):	Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Low
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. * The EA have suggested that there could be small area of land that lies within Flood Zone 3b, and this must be confirmed when a site specific FRA is undertaken. Land raising and flood compensation may not be viable for this development but should be discussed with the Environment Agency through the specific FRA. ***Alternative sites should be explored in lower flood risk areas.***

Table 5-37 Development site Castle Street

Site: **Option:**	**041386 – 38 Castle Street** **1**
OS NGR:	TR 3208 4151
Size (ha):	0.01
Number of Dwellings:	5
Planning Permission Granted?	Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 0%, FZ2 90%, FZ1 10%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 80%, FZ2 CC 20%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development Residual risk of flooding due to culvert blockages
Defended:	Fluvial – None
Historical flooding / Drainage on site:	No information available.

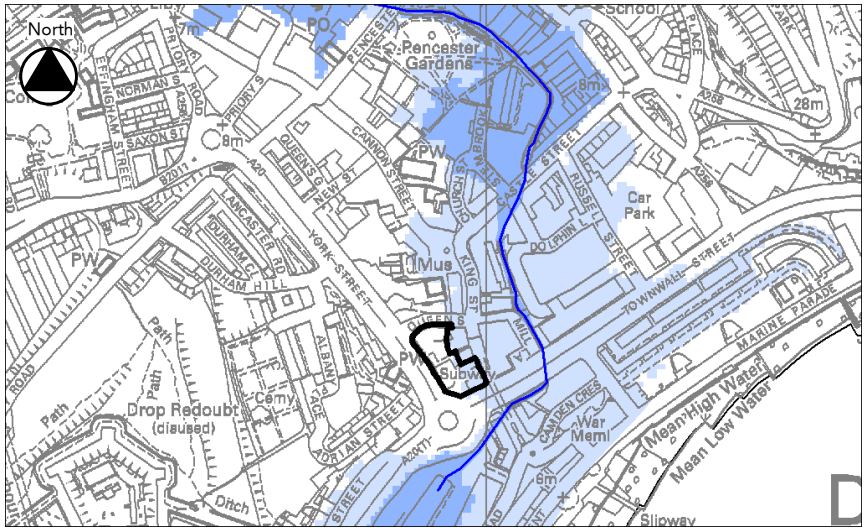
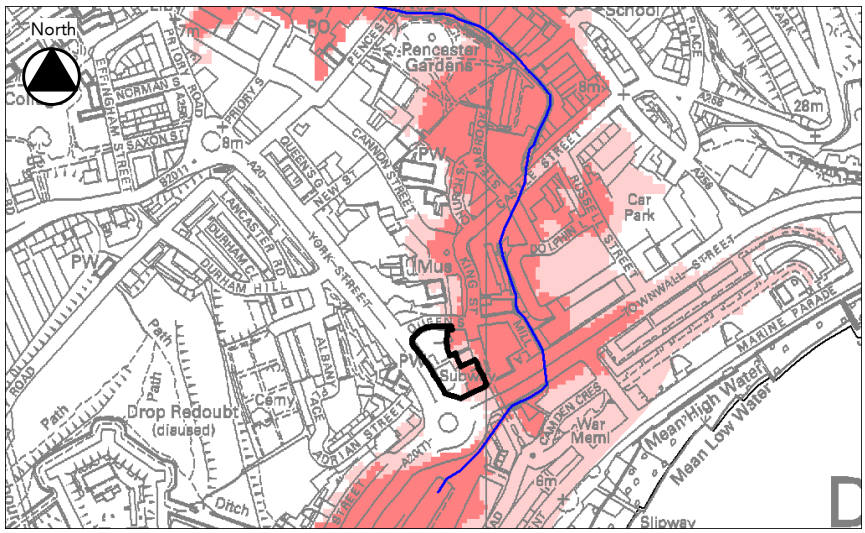
Site: **Option:**	**041386 – 38 Castle Street** **1**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No – although taking climate change into account the site does fall within FZ3aCC and the Environment Agency may stipulate that the Exception Test is required.
Likelihood of passing Test:	N/A
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Land raising and/or flood compensation will be necessary.

Table 5-38 Development site around the St. James' area

Site: **Option:**	**LPA – St. James' Area** **1**
OS NGR:	TR 3214 4143
Size (ha):	3.55
Number of Dwellings:	39
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 0%, FZ2 57%, FZ1 43%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 22%, FZ2 CC 39%, FZ1 39%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development. Residual risk of flooding due to culvert blockages
Defended:	Fluvial – None
Historical flooding / Drainage on site:	No information available.

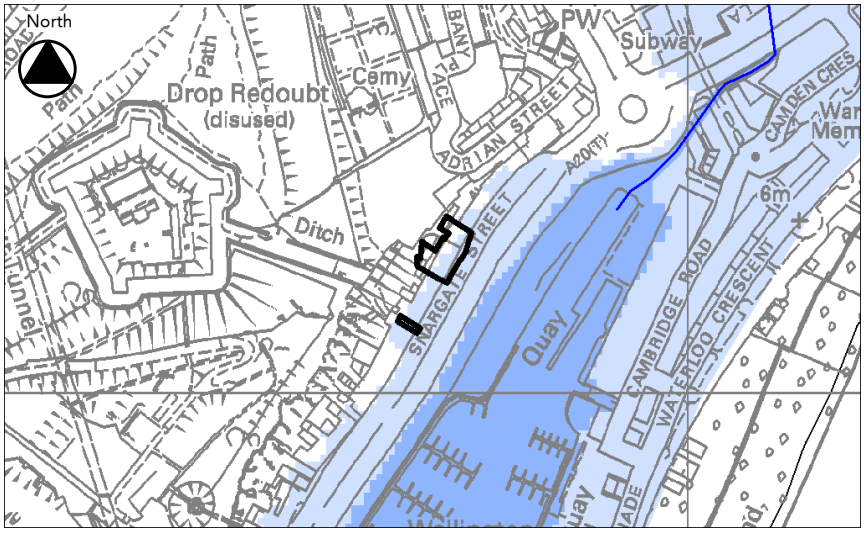
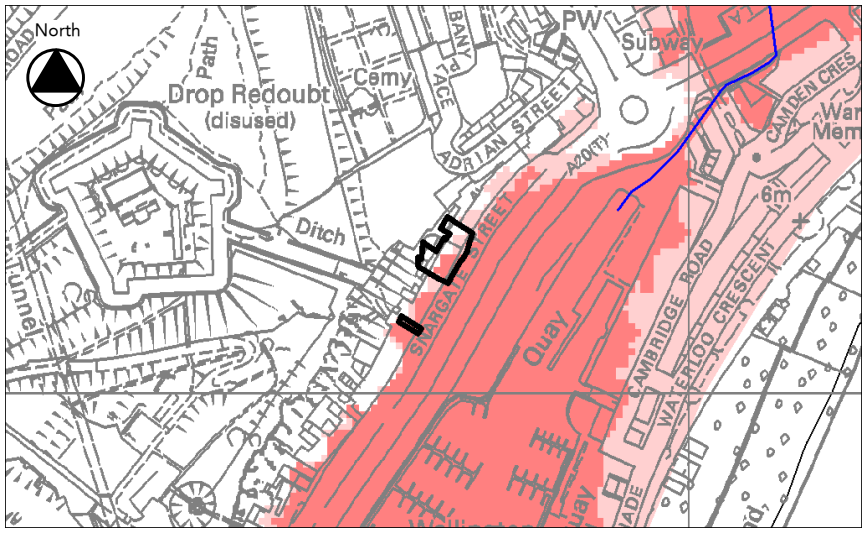
Site: **Option:**	**LPA – St. James' Area** **1**
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield and Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No – although taking climate change into account the site does fall within FZ3aCC and the Environment Agency may stipulate that the Exception Test is required. Additionally, may be shown to lie within FZ3a following more detailed modelling during the site specific FRA.
Likelihood of passing Test:	N/A
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Instead of seeking other sites for the development, it may be more appropriate to set the boundary back from the river and/or to incorporate water compatible and/or open space areas into the development option. Land raising and flood compensation will be necessary.

Table 5-39 Development site at York Street

Site: **Option:**	**PDL/UC – Land on the corner of York Street** **1**
OS NGR:	TR 3195 4127
Size (ha):	0.35
Number of Dwellings:	10
Planning Permission Granted?	No
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 0%, FZ2 30%, FZ1 70%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3aCC 10%, FZ2 CC 21%, FZ1 69%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Fluvial
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Fluvial – None
Historical flooding / Drainage on site:	No information available
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Chalk

Site: **Option:**	**PDL/UC – Land on the corner of York Street** **1**
and site characteristics):	Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield and Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No – although taking climate change into account the site does fall within FZ3aCC and the Environment Agency may stipulate that the Exception Test is required.
Likelihood of passing Test:	N/A
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Land raising and/or flood compensation will be necessary.

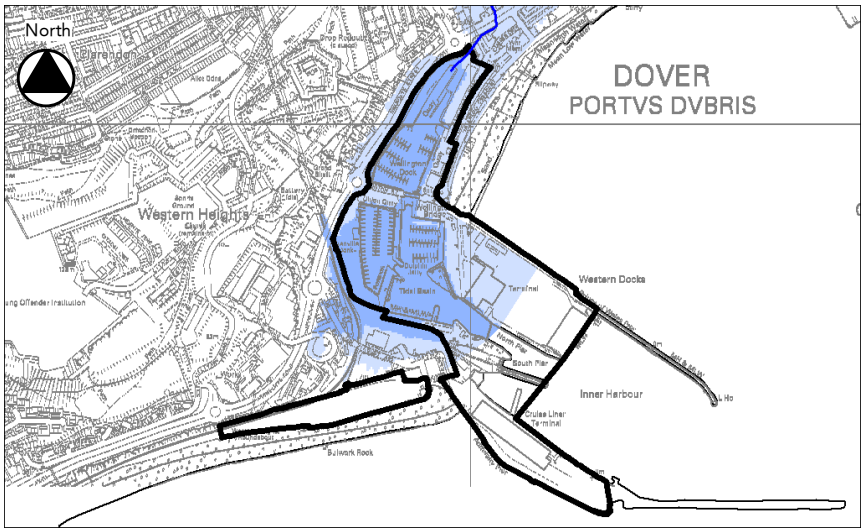
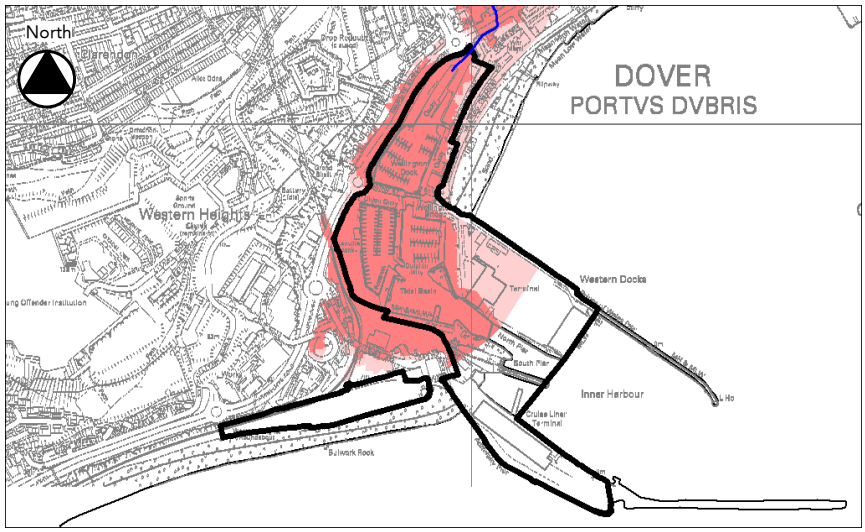
Table 5-40 Development sites at Snargate Street

Site: **Option:**	**041384 – 149-156 Snargate Street** **031218 – 141 Snargate Street** **Both sites are within Option 1**
OS NGR:	TR 3178 4107
Size (ha):	0.12 (149 – 156) 0.01 (141)
Number of Dwellings:	24 (149 – 156) 5 (141)
Planning Permission Granted?	149-156 Snargate Street – Yes 141 Snargate Street - Yes
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 0%, FZ2 45% (149 – 156), FZ1 55% FZ3a 0%, FZ2 100% (141)  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3a CC 35%, FZ2 CC 10% (149 – 156), FZ1 55% FZ3a CC 80%, FZ2 CC 20% (141)  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal/Fluvial

Site: **Option:**	**041384 – 149-156 Snargate Street** **031218 – 141 Snargate Street** **Both sites are within Option 1**
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.
Defended:	Tidal – None Fluvial - None
Historical flooding / Drainage on site:	No information available.
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield and Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	No – although taking climate change into account the site does fall within FZ3aCC and the Environment Agency may stipulate that the Exception Test is required.
Likelihood of passing Test:	N/A
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Land raising and/or flood compensation will be necessary.

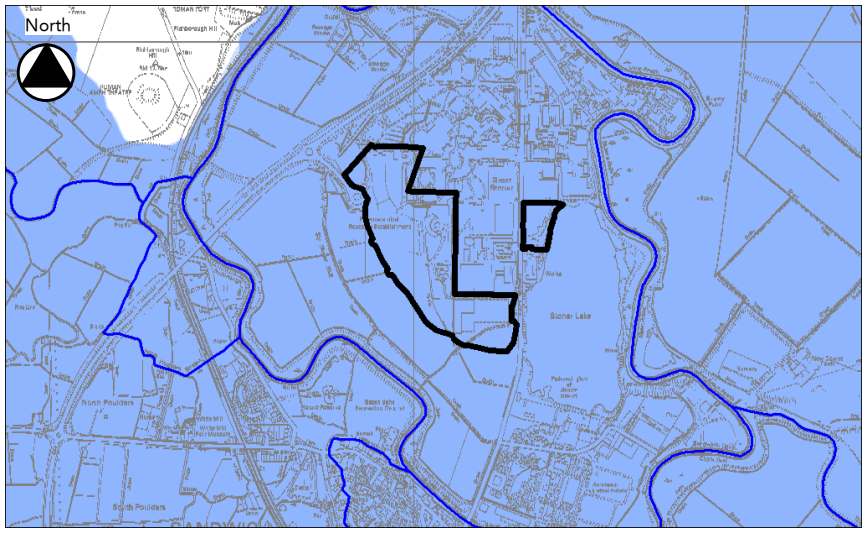
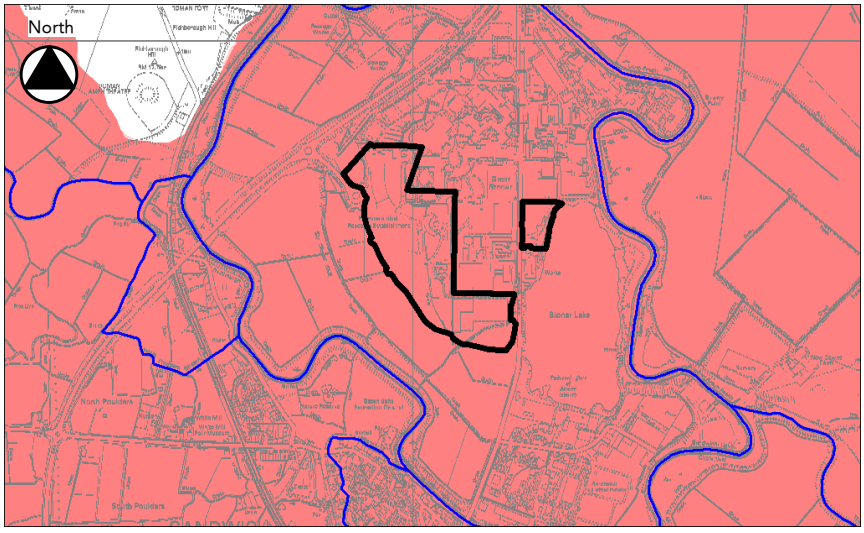
5.5 Proposed development site (employment and other uses) within flood zones

Table 5-41 Mixed use sites within the Dover area

Site: **Option:**	**Dover port** **Employment**
OS NGR:	TR 3187 4067
Size (ha):	39.68
Current development aspirations:	Residential – 300 apartments Retail – 5,000m^2 net lettable Offices – 4,000m^2 Leisure – a 200 bedroom 4-star hotel to cater for the cruise trade and restaurants and cafes to serve marina and port offices.
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 35%, FZ2 23%, FZ1 42%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3a CC 45%, FZ2 CC 13%, FZ1 42%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk. Surface water runoff could be a flood risk due to the surrounding urban development.

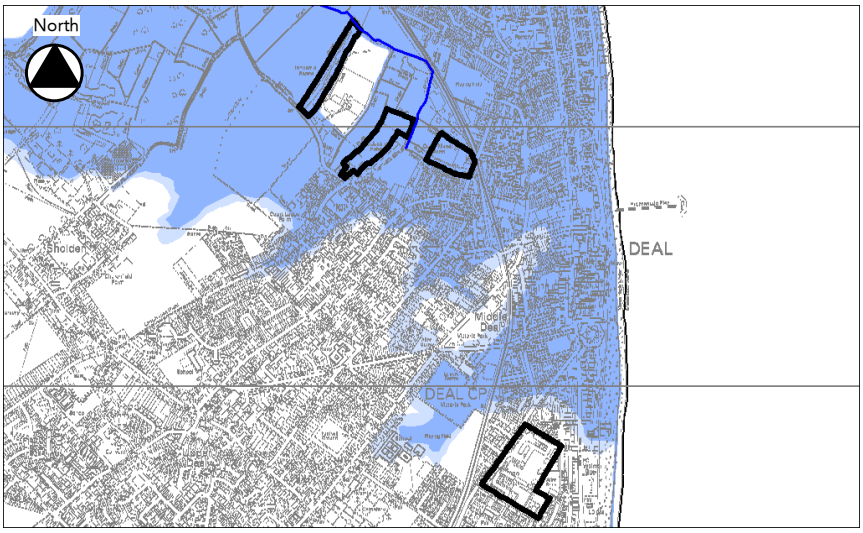
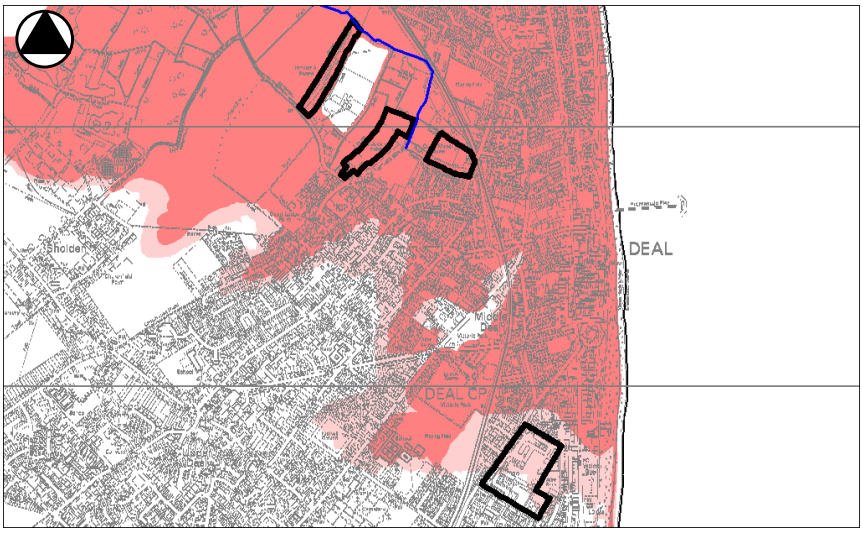
Site: **Option:**	**Dover port** **Employment**
Defended:	Tidal - None
Historical flooding / Drainage on site:	No information available.
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soil – Shallow silty over chalk
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Brownfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: None
Exception Testing	
Exception Test Applicable?	Yes
Likelihood of passing Test:	Medium to High
Range of Modelled Flood Depths:	Not applicable as no defences are present and therefore no further analyses were undertaken.
Range of Modelled Flood Velocities:	
Mitigation Measures:	See section 5.7
Recommendations:	The desk top assessment of historical flooding has highlighted this area to be 'high' risk with flood events occurring regularly. It is strongly recommended that the detailed FRA must include a detailed hydraulic model to accurately assess flood risk in this area. This SFRA is based only on a broadscale model. Land raising and/or flood compensation maybe required and will need to be discussed with the Environment Agency.

Table 5-42 Employment sites within the Sandwich area

Site: **Option:**	**Sandwich area** **Employment**
OS NGR:	TR 3328 5933
Size (ha):	29.98 (combined area of both sites)
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3a CC 100%, FZ2 CC 0%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal Fluvial – River Stour
Sources of Flooding:	Surface water run-off could be an issue due to the wet clay soil.
Defended:	Tidal – shingle sea defence from Sandwich Bay to Sandown Castle Fluvial – Raised defence embankment along Stour left bank
Historical flooding / Drainage on site:	No information available.
Soil map data (Geology / Map symbol and subgroup / Soil	Geology – Sandstone/Chalk Soil – Seasonally wet deep clay

Site: **Option:**	**Sandwich area** **Employment**
and site characteristics):	
Indicative suitability for SUDS:	Low – see section 5.8
Brown / Greenfield:	Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Yes – The Tidal Great Stour from Pegwell Bay to Fordwich. The site is located within the loop of the River Stour through Sandwich, which acts as a storage area for flood water where it is undefended. Any further development in this area will result in loss of floodplain storage which would need to be compensated for.
Exception Testing	
Exception Test Applicable?	No, not if the site remains entirely employment based.
Likelihood of passing Test:	N/A
Flood risk type and location:	Overtopping of dunes at Pegwell Bay
Range of Modelled Flood Depths (m):	1.4 – 2.6
Range of Modelled Flood Velocities (m/s):	1.0 – 2.0
Time to inundations from point of overtopping or breach (hrs):	5
In RIZ?	No
Mitigation Measures:	See section 5.7
Recommendations:	A site specific FRA will be required. Land raising and/or flood compensation will be required and will need to be discussed with the Environment Agency.

Table 5-43 Employment sites within the Deal area

Site: Option:	Deal area Employment
OS NGR:	TR 372 525
Size (ha):	6.14 (combined area of 3 northern sites) 5.61 (southern site)
Flood Zone coverage: *Legend:* Main River Development Site Flood Zone 3a Flood Zone 3b Flood Zone 2	FZ3a 100%, FZ2 0% (3 northern sites) Southern sites lies outside the current FZ3 and FZ2 – FZ1 100%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Climate Change coverage: *Legend:* Main River Development Site Flood Zone 3a CC Flood Zone 3b Flood Zone 2 CC	FZ3a CC 100%, FZ2 CC 100% (3 southern sites) FZ3a CC 0%, FZ2 CC 70%, FZ1 30%  *© Crown copyright. All rights reserved. Dover District Council Licence number 100019780, 2007*
Tidal/Fluvial:	Tidal
Sources of Flooding:	Potential groundwater flooding due to underlying chalk.
Defended:	Tidal – Concrete sea wall, groynes and secondary splash wall from Sandown Castle to 200m South of Pier
Historical flooding / Drainage on site:	No information available.

Site: Option:	Deal area Employment
Soil map data (Geology / Map symbol and subgroup / Soil and site characteristics):	Geology – Chalk Soils – Seasonally wet deep clay/deep silty
Indicative suitability for SUDS:	Low/Medium – see section 5.8
Brown / Greenfield:	Brownfield and Greenfield
Located in Source Protection Zone?	No
Additional information:	Flood Warning Area: Coastal areas from Pegwell Bay to Folkestone.
Exception Testing	
Exception Test Applicable?	No, not the development sites remain entirely employment based.
Likelihood of passing Test:	N/A
Flood risk type and location:	Northern sites: Breach of the coastal defence north of Sandown Castle Southern Site: Not affected by breach or overtopping scenarios
Range of Modelled Flood Depths (m):	1.2 – 1.4
Range of Modelled Flood Velocities (m/s):	0.6 – 0.8
Time to inundations from point of overtopping or breach (hrs):	1
In RIZ?	No
Mitigation Measures:	See section 5.7
Recommendations:	A site specific FRA will be required. Land raising and/or flood compensation maybe required and will need to be discussed with the Environment Agency. There is only 1 hour to inundation and therefore little flood warning time, as the Environment Agency's current warning is 2 hours. Suitable evacuation procedures will need to be in place.

5.6 Summary of development options

It is considered that other sites should be explored for the following proposed development options:

- 011167 – Land north of the River Stour, Ramsgate Road and part of Sandwich Industrial Estate
- 000142 – West of Pillory Gate Wharf, Strand Street
- Malcolm Waite Ltd. Moat Sole
- SA – Jesus Quay
- UC/PDL – Garage Block, Ethelbert Road
- LDF/PD Cannon Street (unless safe access and egress is provided)
- 970552 – Land north of Ark Lane (unless safe access and egress is provided)
- 040261 – 89 Northwall Road
- LPA – Northwall Road
- 980755 – 36 High Street (Formerly Black horse PH)
- PDL/UC – Factory building, Lorne Road
- 030983 – Art School, The Paddock
- LDF/PD – Mid Town Area

5.7 Mitigation measures

Where allocations remain in high risk Flood Zone areas, it needs to be demonstrated that technically feasible flood mitigation options are available. A fuller appreciation of the sustainability of the site and its mitigation measures will be addressed via the Sustainability Appraisal. These measures must be designed to provide an appropriate level of flood mitigation to a site for the lifetime of the development. At most sites it is technically feasible to mitigate or manage flood risk (if potential off-site impacts are ignored), however the measures required may result in some practical constraints on development and/or require significant financial cost where flood risk is high.

The fact that mitigation measures are discussed in this SFRA should not be taken as a presumption that the Sequential Test has been bypassed. It is included to give a fuller picture of the implications of allocating a site, and for use in the subsequent SA.

Often the determining factor in deciding whether a particular development can or cannot proceed is the financial feasibility of flood risk mitigation rather than technical limitations. Detailed technical assessments are required in the detailed site-based FRA to assess this feasibility, together with a commercial review by the developer of the cost of the mitigation works. However, it is important at the SFRA stage that allocations or areas where there is little or no chance of feasible flood risk mitigation are not recommended, because doing so could have an adverse impact on the achievement of development targets in the Development Plan or LDF.

At the SFRA stage broad assumptions are therefore required regarding the feasibility of flood risk mitigation to ensure that only sites with realistic development potential are put forward. In this context the assumptions shown in Table 5-44 and Figure 5-1 have been made, although these shold only be used as guidance for commercial Less Vulnerable development. It is assumed that floor level raising will continue to be the traditional mitigation measure, particularly for residential developments where the EA normally recommend raising flood levels either 300 or 600mm above estimated flood levels. It should be noted that the Environment Agency see actual land raising as a last option. This table refers to depths of flooding before mitigation measures are put in place and should not be mistaken as acceptable levels of flooding after mitigation. Thought will also be required to ensure dry access and egress is available during the 0.5% tidal event or 1% fluvial event.

It is recognised that in some locations urban regeneration and redevelopment will be essential to maintain the long term viability and vitality of communities and the balance of the raft of planning considerations may support redevelopment. These social considerations may justify a relaxation of the screening criteria set out below and the retention of housing and Employment allocations in certain areas. In these instances the commercial viability of the development and risks to public safety will need to be given careful considerations during the planning of the development. A range of flood management and flood proofing measures are available that can reduce the financial impacts of flooding.

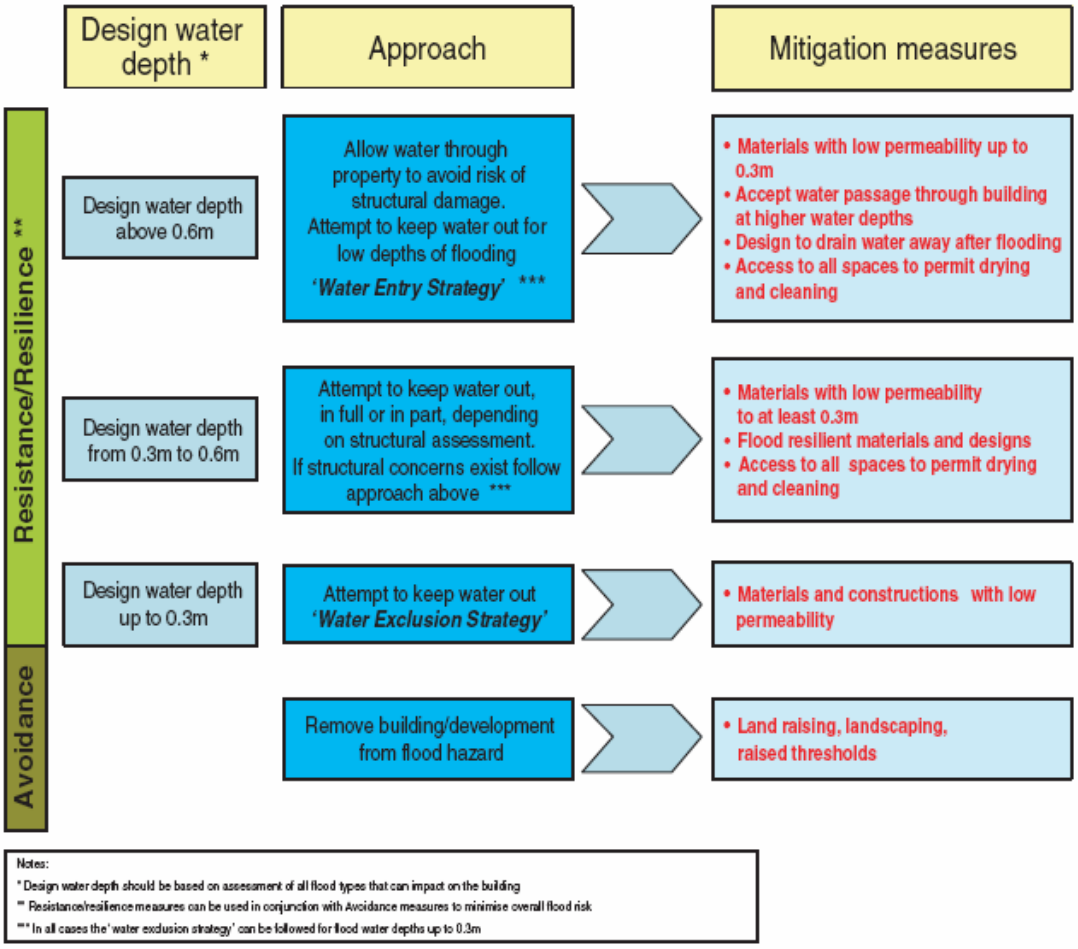
Whilst flooding mitigation measures can be implemented in most sites, it is worth noting that in some instances the findings of individual FRAs may determine that the risk of flooding to a proposed development is too great and mitigation measures are not feasible. In these instances, the development will be subject to an objection by the Environment Agency.

Table 5-44 Screening Criteria for Mitigation Measures

Predicted current Depth of Inundation at the site*	Comments
0 to 1.0 m	Sustainable mitigation and flood risk management may be feasible for both housing and employment purposes. There is a greater likelihood that the Exception Test can be passed. The site should not be in the way of an active flood path.
1.0 to 1.5 m	Mitigation is likely to be costly and may not be economically justifiable for low value land uses. Housing allocations are considered appropriate, provided flood risk can be managed or mitigated (e.g. by using lower levels for car parks or public areas). Floor level raising for employment purposes is unlikely to be economically viable and employment allocations should be reconsidered in favour of alternative

Predicted current Depth of Inundation at the site*	Comments
	lower risk sites. If a lower standard of protection is acceptable and viable and the allocation is required for sustainable development needs the site could be considered. The likelihood of passing the Exception Test is lower.
Above 1.5 m	Flood risk mitigation measures are unlikely to be economically justifiable and both housing and employment allocations should be reconsidered in favour of alternative lower risk sites. Flow routes may be heavily impacted by the development and increases in flood risk downstream would be difficult to compensate for within the development footprint. Development is unlikely to be sustainable and the likelihood of passing the Exception Test is low.
Notes: * Based on predicted depth of inundation for the 0.5% tidal event or 1% fluvial event.	

Figure 5-1 Rationale for flood resilient and/or resistant design strategies[15]



[15] Communities and Local Government (2007) Development and Flood Risk: A Practice Guide Companion to PPS25 'Living Draft' (Table 5.1. p.91)

5.8 SUDS measures

The site tables presented above give an indication of the likely suitability of sites for SUDS methods for managing surface water runoff on proposed new development sites. This guidance has been based on the underlying geology and soils at each site. As such, this guidance should be treated as indicative only and should be further assessed when a site-specific Flood Risk Assessment is undertaken.

Table 5-45 suggests SUDS techniques that could be suitable for each rating given in the tables (i.e. low, medium or high suitability), but is only a preliminary guide and is not exhaustive. Before serious consideration can be given to the design of SUDS, it is imperative that the water table is low enough and a site specific infiltration test is undertaken. Additionally, where sites lie within or close to source protection zones further restrictions may be applicable, and guidance should be sought from the Environment Agency.

Table 5-45 SUDS suitability

SUDS suitability	Reasoning	Possible methods
Low – poor suitability	Poorly draining soils or geological layer for the site, e.g. a clay soil layer and/or underlying chalk where the groundwater level is high.	Try to minimise impermeable surfaces wherever possible.
Medium – reasonable suitability	Reasonable drainage for the site, e.g. a shallow silty layer with underlying sandstone or chalk.	Minimise permeable surfaces wherever possible. Some SUDS techniques may be feasible such as swales or ponds.
High – good suitability	Well drained site, e.g. a deep silty layer with underlying sandstone or chalk where the groundwater level is low.	Infiltration devices such as soakaways or infiltration trenches. Permeable surfaces e.g. gravel. Most SUDS techniques would be suitable.

5.9 Identification of Localised Drainage Issues

In addition to tidal and fluvial flood risk, alternative sources of flooding including groundwater, overland flow and surface water drainage also need to be considered when planning development. Although explicit consideration of these sources of flooding is not a requirement for Flood Zone allocation, local drainage issues have the potential to cause substantial damage and distress. When considering development proposals, known drainage and surface water problems need to be taken into account.

Where data has been made available, locations that have had reported local flooding problems have been included in the site tables. This allows an early indication of the scale of any possible impacts from development in these areas and the need for a detailed FRA looking at these impacts.

Where a localised drainage issue has been identified, further development upstream of this location has a potential to exacerbate the existing problem by increasing discharge and altering the flow regime of the watercourse or the floodwater path. For this reason, all proposed developments need to consider mitigation measures to ensure flood risk is not increased either upstream or downstream of the proposed development. Mitigation may take the form of sustainable drainage techniques or surface water attenuation. The consideration of soil type will provide a positive contribution in the consideration of drainage arrangements strategically and therefore will be considered on sites selected for development in Flood Zones 2 and 3, which give an indication of their suitability for Sustainable Drainage Systems (SUDS). It should be stressed that whilst the permeability of the soil is an important consideration for infiltration techniques, some SUDS techniques can be used on impermeable soils and could help aid attenuation by reducing

conveyance time. This should be considered by the developer and Council at the planning application stage.

5.10 Limitations of Background Information

Data and models are key to the understanding of the scale of the flood risk. However the data used in the SFRA is limited in many aspects and it is important that these limitations are considered.

Where there is no reference to localised flooding issues at a site, this does not necessarily mean that there are none, data may not have been made available to us.

The soil and geology maps can only give an indication of what the soils are like at a site, as the map (scale (1:250,000)) clearly does not provide sufficient detail. In addition, soils can change significantly within a short distance, within the same field. This highlights the need for a site-specific assessment of underlying geology and soils so that effective drainage and flood risk management techniques can be applied.

6 GUIDANCE FOR DETAILED FLOOD RISK ASSESSMENTS

6.1 General

In accordance with current planning policy guidance, the planning process encourages only sustainable development in areas vulnerable to flooding. This includes adopting a precautionary approach to decisions based on estimates of the present and future impact of flood risks. The Dover District SFRA focuses on delivering a strategic assessment of flood risk within the area. Prior to development, site specific assessments will need to be undertaken to ensure that all forms of flood risk, at a site, are fully addressed. In addition, following the Sequential Test, some sites may be put forward for the Exception Test. This will require a FRA. It is normally the responsibility of the developer to provide a FRA with an application. However, an LPA can decide to commission a detailed, site-specific FRA to help them decide upon allocations in the high risk zone. The SFRA cannot provide this level of site specific information.

6.2 Standard Flood Risk Management Guidance for Developers

The aim of a Flood Risk Assessment (FRA) is to demonstrate that proposed development will not be at risk to flooding during the design event. This includes assessment of mitigation measures required to safely manage flood risk. The FRA also needs to demonstrate that the proposed development will not increase flood risk either upstream or downstream of the site. All sources of flood risk, including tidal, fluvial, surface water runoff and drainage need to be considered.

Flood Risk Assessments for proposed development in the borough should follow the approach recommended by:

- The Environment Agency (see its *National Standing Advice to Local Planning Authorities for Planning Applications – Development and Flood Risk in England* (June 2004);
- DEFRA/Environment Agency, 2005. *Flood Risk Assessment Guidance for New Development Phase 2: Framework and guidance for Assessing and Managing Flood Risk for New Development – Full Documentation and Tools.* R&D Technical Report FD2320/TR2;
- PPS25 and its Practice Guide Companion.

These documents describe when a FRA is required and are commensurate with the advice given in this SFRA. All proposed development sites require at least an initial assessment of flood risk. A detailed FRA will be required for all developments that fall in the medium and high flood risk zones and other sites where significant flood risk is identified. A brief FRA will be required for sites in Flood Zone 1 which are greater than 1 ha (unless there are significant flooding issues, when a more detailed FRA will be necessary).

The SFRA provides guidance on what tests and standards need to be provided by the development. This would be elaborated on within the FRA, which should thoroughly investigate how the residual risks after mitigation are managed and their impacts elsewhere.

6.3 Assessment of Tidal and Fluvial Flood Risk

Some of the potential sites are located in Flood Zone 1. They are, therefore, considered to be at little or no risk to flooding from the sea or watercourses.

When considering future development needs in the region, a detailed and site specific FRA is required. The design criterion for development within floodplain areas is generally to the design event coinciding with a 0.5% AEP tidal flood event and a 1% AEP fluvial flood event, including the impact of climate change. PPS25 and this SFRA require the residual risks to be established for an extreme event, namely the 0.5% plus climate change event. This extreme event is used to test the robustness of the mitigation scheme, particularly ensuring that the potential for loss of life is removed. This extreme event may involve a breach in a flood defence. There is no prescribed design standard set out in PPS25, and it is essentially down to the applicant to decide what level of

residual risk will be acceptable. However, this SFRA describes flood management policy frameworks that ascribe a minimum standard for residential or medium and high vulnerability development. This would be the aim for less vulnerable development, but it is accepted that sometimes this is not practicable or commensurate with the risks.

Detailed consideration will need to be given to the impact these mitigation measures may have and it is a requirement to ensure that flood risk is not increased elsewhere as a result of development. Compensation measures may take the form of compensatory flood storage as mitigation for loss of floodplain, enhanced flood defences and flood compatible master planning. This concept is included in PPS25 and ensures that residual risk is fairly managed in new and existing development.

Before embarking on detailed modelling, and in light of this SFRA, proposals for development should be discussed in detail with the Environment Agency at an early stage.

The floodplain assessments could be conducted using hydraulic models. However, before any modelling is undertaken a review of available information should be conducted to assess if modelling is necessary.

For fluvial floodplains an assessment of the hydrological regime is required. This should be undertaken using available gauged records and Flood Estimation Handbook (FEH) techniques.

Hydraulic modelling will need to include structures, such as bridges and weirs that influence flood levels. This modelling should include floodplains to accurately determine the depth and extent of flooding. Residual risk will also need to be assessed for those sites located behind flood defence infrastructure.

Whenever possible models should be verified using historical records of flooding. The sensitivity to modelling assumptions and climate change should also be investigated. Mapping the extent of flooding will enable the risk of flooding to a development to be assessed.

6.4 Surface Water Drainage Assessments

Opportunities for developing an Integrated Water or Drainage Management Strategy across development site boundaries should be explored, and a catchment led approach should be adopted. This approach has been recognised in the recent consultation paper by DEFRA, *Making Space For Water*. An integrated approach to controlling surface water drainage can lead to a more efficient and reliable surface water management system as it enables a wider variety of potential flood mitigation options to be used. In addition to controlling flood risk, integrated management of surface water has potential benefits, including improved water quality and a reduction of water demand through grey water recycling, and rainfall harvesting.

Integrated drainage systems may be considered suitable for catchments where other development is being planned or constructed, and where on-site measures are set in isolation of the systems and processes downstream.

Surface water drainage assessments are required where proposed development may be susceptible to flooding from surface water drainage systems. The potential impact upon areas downstream of the development, including the impact on a receiving watercourse, also needs careful consideration.

This SFRA gives an indication of the soil type at the sites / allocations, and their suitability for Sustainable Urban Drainage Systems.

The requirements for surface water drainage systems will need to be discussed with the Environment Agency and Southern Water. Consideration should be given to whether a “Greenfield runoff approach” to the assessment of source control is appropriate. This method is generally satisfactory in the cases where the development is relatively small, isolated from other planned sites and where the runoff processes are fully understood.

The FRA should then conclude with an assessment of the scale of the impact, and the recommended approach to controlling surface water discharge from a proposed development.

6.5 Future Planning Applications

The first document that local planners should refer to when considering future planning applications is the Environment Agency's *National Standing Advice to Local Planning Authorities for Planning Applications – Development and Flood Risk*, England (June 2004).

This SFRA is not intended to be a prescriptive document, but a planning tool to guide future sustainable development away from vulnerable flood risk areas.

6.6 Environment Agency Objection to Planning Authority

The SFRA should be used as a 'first pass' to test the validity of the Environment Agency's objection to any future development.

If the development meets with the recommendations of the SFRA strategically, then the specifics of an objection should be addressed in a FRA.

A precautionary approach to development and flood risk is required. At each site, applicants for all development proposals need to carry out an assessment of flood risk from all sources and they also need to consider the potential impact the development could have on others through the completion of a flood risk and runoff assessment. Guidance on the detail required in this assessment for different types of development is provided by the Environment Agency through their standing advice on development and flood risk. If the Environment Agency's requirements for sustainable development can be met through completion of a FRA then their objection, on the basis of flood risk, is more likely to be lifted.

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MAPS

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APPENDICES

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Appendix A National Plans, Policies and Strategies

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A.1.1 Planning and Compulsory Purchasing Act

The SFRA has been undertaken whilst planning authorities have been implementing the provisions of the Planning and Compulsory Purchase Act 2004, together with the accompanying planning guidance, including Planning Policy Statement 1 *Delivering Sustainable Development* (PPS1) and Planning Policy Statement 12 *Local Development Frameworks* (PPS12). The Act has affected all tiers of the planning system and has necessitated major changes at regional and local level.

Planning Policy Guidance (PPG) has been reviewed by Government and was updated and replaced by Planning Policy Statements in December 2006. Government has indicated that PPGs will be replaced as and when considered necessary and in the light of their policy and strategic significance.

At a District Council level, Local Plans are to be phased out and replaced by Local Development Frameworks (LDF), which are a suite of planning documents that will guide decisions on the development and use of land. Where Local Plans have been adopted recently, or preparation is at an advanced stage, the process will continue to adoption providing 'saved policies' for development control purposes. As the new Development Plan Documents are adopted, they will replace parts of the Local Plan. However, where it is proposed to cease work on the review of Local Plans and to commence work on LDFs, only those local plan policies which form part of the Development Plan can be saved.

Local Planning Authorities (LPAs) were required to produce a Local Development Scheme (LDS) by March 2005, setting out their programme for the production of the new development plan and summarising the documents that will, collectively, make up the Local Development Framework. Hence the transition provides an ideal opportunity for each of the local authorities to review and update their policies on flood risk.

A.1.2 Planning Policy Statement 1 (PPS1): Delivering Sustainable Development[16]

PPS1 published in February 2005, sets out the overarching planning policies for the delivery of sustainable development across the planning system and sets the tone for other planning policy statements. PPS1 explicitly states that development plan policies should take account of flooding, including flood risk. It proposes that new development in areas at risk from flooding should be avoided. Planning authorities are also advised to ensure that developments are "sustainable, durable and adaptable" including taking into account natural hazards such as flooding.

PPS1 also places an emphasis on 'spatial planning' in contrast to the more rigid 'land-use planning' approach which it supersedes. Planning authorities will still produce site specific allocations and a proposals map part of relevant Local Development Documents, but their Core Strategy will be more strategic and visionary in content. The Core Strategy will take into account the desirability of achieving integrated and mixed use development and will consider a broader range of community needs than in the past. With regard to flood risk, it will be important for the Core Strategies and accompanying supplementary planning documents to recognise the contribution that non-structural measures can make to flood management.

A.1.3 Planning Policy Statement 3 (PPS3): Housing[17]

PPS3 has the aim of creating sustainable, inclusive, mixed communities in all areas, both urban and rural (paragraph 9) There is an emphasis on giving priority to re-using previously-developed land within urban areas, bringing empty homes back into use and converting existing buildings, in preference to the development of greenfield sites. Re-use of previously-developed land, empty properties and the conversion of non-residential buildings into housing is encouraged, both to promote development and reduce the amount of Greenfield land being taken for development. The aim is to provide 60% of additional housing on re-used land and buildings by 2008. Each region

[16] http://www.communities.gov.uk/pub/806/PlanningPolicyStatement1DeliveringSustainableDevelopment_id1143806.pdf (accessed 25/06/07)
[17] http://www.communities.gov.uk/pub/97/ConsultationPaperonaNewPlanningPolicyStatement3PPS3Housing_id1162097.pdf (accessed 25/06/2007

will contribute to the national target by setting recycling targets within their RPG. LPAs should contribute to the regional targets by incorporating land recycling into their development plans. Paragraph 38 lists flood risk as one of the reasons that previously developed land might be unsuitable for housing allocation, although in Annex C PPS3 also states: *'A Strategic Housing Land Availability Assessment should: Identify what action could be taken to overcome constraints on particular sites'.*

A.1.4 Planning Policy Statement 4 (PPS4): Industrial Development[18]

PPS4 replaced PPG4, Industrial and Commercial Development and Small Firms in March 1997

The overall document commits to a goal of sustainable development, and the opening statement shares responsibility for sustainability throughout the community as a whole.

'Responsibility for the environment is not solely the preserve of Government. The principles of sustainable development require the responsible use of manmade and natural resources by all concerned in a way that ensures that future generations are not left worse off'

This planning statement reflects the Governmental aim to recycle disused land. *'Previously developed urban land which is ripe for re-development may provide opportunities for industrial development perhaps in conjunction with other uses. The existence of redundant factory premises and derelict industrial land can be an important resource for the creation of new job opportunities in areas of high unemployment. Such brownfield sites are often well suited to re-development with balanced mixed-use schemes which include an element of industrial development.'*

With regard to flooding, the only direct mention in PPS4 is in paragraph 29:

- 'All proposals for the development of land for industrial purposes will be expected to meet all of the following criteria:
- They must be compatible with the character of the surrounding area.
- They must be compatible with adjacent land uses, especially housing.
- They must not be likely to cause detriment to valuable areas or features of nature conservation interest or man-made heritage.
- They must, where possible, avoid the loss of high grade agricultural land.
- They must not result in a significant increase in traffic congestion or be a hazard to road safety.
- **They must not be likely to cause or exacerbate flooding.**
- They must be capable of dealing satisfactorily with any emission or effluent.'

A.1.5 Planning Policy Statement 6 (PPS6): Planning for Town Centres[19]

PPS6 is mostly concerned with the type and location of developments and their impact upon the socio-economic vitality of the area. No specific mention is made regarding flooding but the need to re-use existing sites is highlighted in paragraph 2.4 which states *'Wherever possible, growth should be accommodated by more efficient use of land and buildings within existing centres. Local planning authorities should aim to increase the density of development, where appropriate. Opportunities within existing centres should be identified for sites suitable for development or redevelopment or where conversions and changes of use will be encouraged for specific buildings or areas'.*

[18] http://www.communities.gov.uk/index.asp?id=1143959 (accessed 25/06/2007)

[19] http://www.communities.gov.uk/pub/821/PlanningPolicyStatement6PlanningforTownCentres_id1143821.pdf (accessed 25/06/2007)

A.1.6 Making Space for Water[20]

During 2004, the Department for Environment, Food and Rural Affairs (DEFRA) undertook a consultation exercise to engage a wide range of stakeholders in a debate about the future direction of flooding strategy. The 2005 document "Making Space for Water: First Government Response" sets out the following vision:

"…we want to make space for water so that we can manage the adverse human and economic consequences of flooding and coastal erosion while achieving environmental and social benefits in line with wider government objectives."

The aim of the strategy is to balance the three pillars of sustainability, managing flood risk and ensuring that the social and economic benefits resulting from growth and development are attained. This balanced approach, integrating sustainable development with responsible risk management, has underpinned the current study.

Section 7 of the 'Making Space for Water' consultation document deals with measures to reduce flood risk through land-use planning. This section emphasises the Government's commitment to ensuring that the planning system aims to reduce flood risk wherever possible and, in any event, should not add to it. However, it is acknowledged that 10 percent of England is already within mapped areas of flood risk and that contained within these areas are the brownfield sites which other areas of Government policy has identified as a priority for future housing provision. The document asserts that over the past five years, 11 percent of new houses were built in flood-risk areas. The document identifies three sets of measures which may be undertaken to manage flood risk when development is sited in such areas:

- Protection measures to provide, at minimum, the standards of protection specified in PPS25
- Provision of features such as sacrificial areas and compartmentalisation to reduce the consequences of a flood event should one occur
- Use of construction techniques that increase the flood resistance and resilience of buildings.

The document proposes that Regional Spatial Strategies and Local Development Frameworks should take full account of flood risk and incorporate the sequential approach introduced in PPG25 and continued in PPS25. Moreover, the document encourages integration with other plans, in particular Catchment Flood Management Plans[21]. Of particular relevance to the SFRA is the River Stour Catchment Flood Management Plan (Draft)[22] Use of European Union (EU) funding streams, such as Intgerreg IIIB is recommended to enable local authorities to undertake trans-national projects aimed at advancing knowledge and good practice in flood-risk management.

At the development control level, the document encourages local authorities to give full weight to the advice issued by the Environment Agency in response to consultations on planning applications, implying that only in exceptional cases should permission be granted against the Environment Agency's advice. In addition, the use of site specific (local) Flood Risk Assessments as supporting documents to planning applications in areas of flood risk is encouraged. The document proposes that if mitigating measures are shown to be required, they should be fully funded as part of the development.

[20] DEFRA. 2004. *Making Space for Water – Developing a new Government strategy for flood and coastal erosion risk management in England.*

[21] Catchment Flood Management Plans are voluntary plans through which the Environment Agency works with other key decision makers in river catchments to identify and agree policies for sustainable flood risk management.

[22] River Stour Catchment Flood Management Plan (Draft). Environment Agency.

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Appendix B Maps

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Appendix C 1:10,000 Scale Plans

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