Cabinet –
Supplementary agenda No.1

A meeting of the Cabinet will be held on:

Date: 8 April 2014

Time: 3.00pm

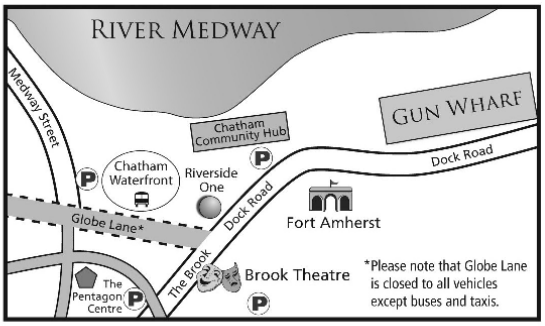
Venue: Meeting Room 2 - Level 3, Gun Wharf, Dock Road, Chatham ME4 4TR

Items

4.	**Rochester Riverside Masterplan** – Appendices 1 and 2	**(Pages 3 - 116)**
6.	**Flood and Water Management Act 2010 - Roles and Responsibilities and the Local Flood Risk Management Strategy** – Appendices 1 and 2	**(Pages 117 - 266)**

For further information please contact Wayne Hemingway/Anthony Law, Democratic Services Officers on Telephone: 01634 332509/332008 or Email: democratic.services@medway.gov.uk

Date: 31 March 2014



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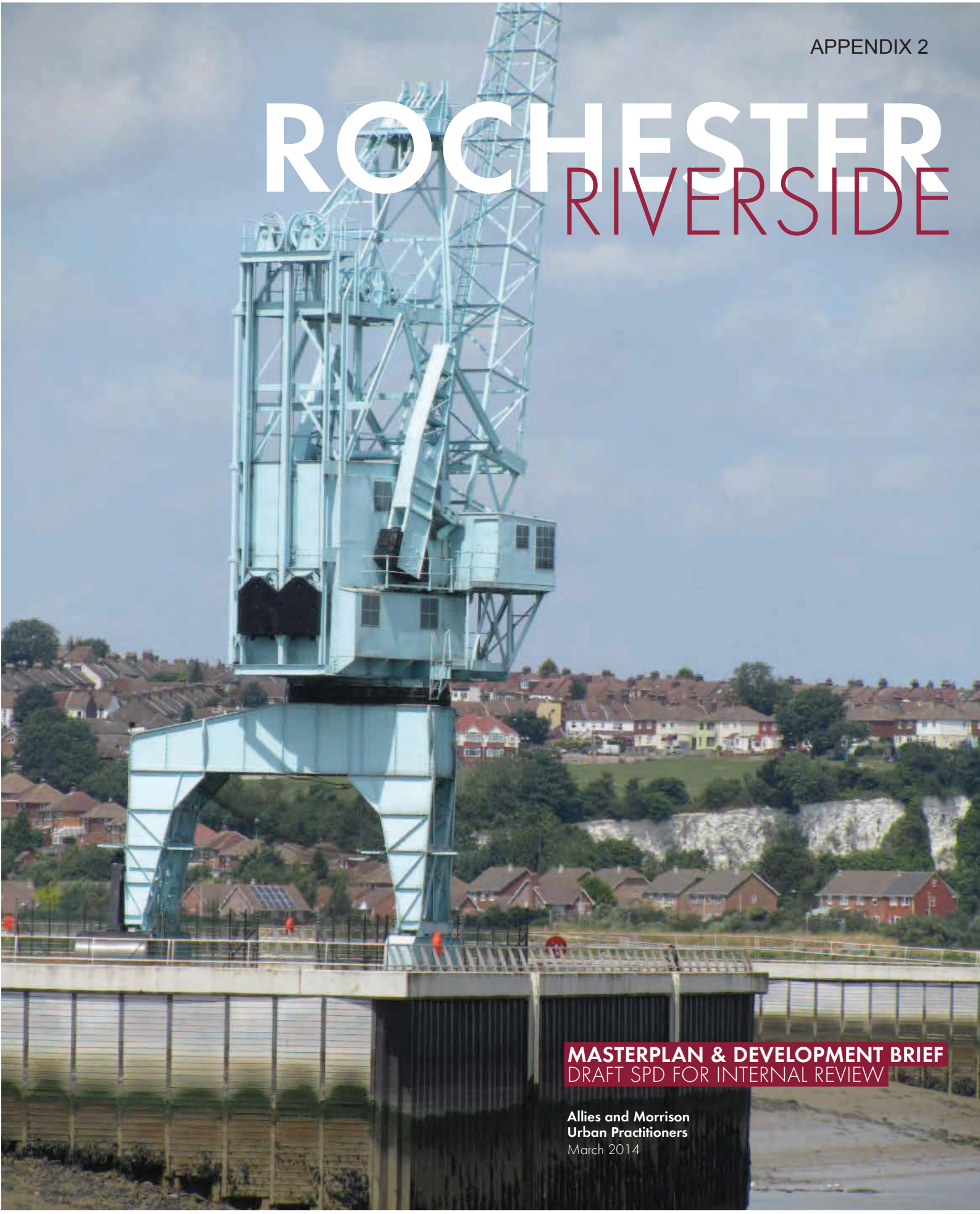
APPENDIX 2

ROCHESTER RIVERSIDE



MASTERPLAN & DEVELOPMENT BRIEF
DRAFT SPD FOR INTERNAL REVIEW

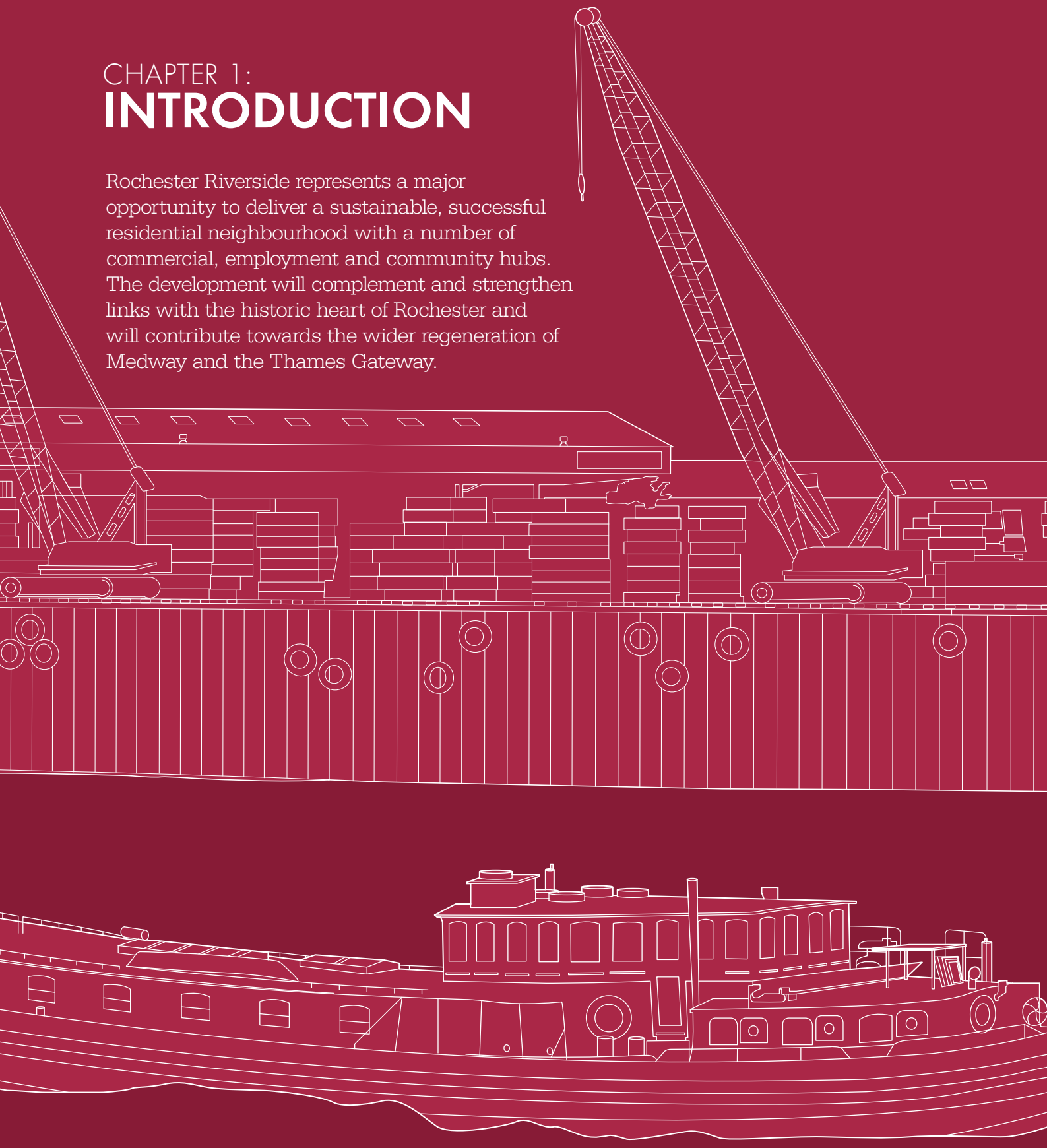
Allies and Morrison
Urban Practitioners
March 2014

CONTENTS

CHAPTER 1:

INTRODUCTION

Rochester Riverside represents a major opportunity to deliver a sustainable, successful residential neighbourhood with a number of commercial, employment and community hubs. The development will complement and strengthen links with the historic heart of Rochester and will contribute towards the wider regeneration of Medway and the Thames Gateway.



1.1 PURPOSE

The primary aim of this Development Brief is to guide the physical aspects of the scheme to bring about a series of high quality developments that will contribute to a wider, cohesive vision for Rochester Riverside.

Aims

The brief does not aim to impose rigid and prescriptive guidelines but establishes a set of strategic parameters and illustrative guidance to steer future development proposals.

The principal aims of the brief are to:

- promote a popular neighbourhood which complements historic Rochester;
- stimulate regeneration of the waterfront through a vibrant mixed use development integrating with the existing character and environmental context of Rochester;
- ensure long term benefits for Rochester's existing and future residents and visitors;
- create an inspirational approach to urban design, architecture and public realm;
- recognise the site's role in securing and enhancing the area's ecological potential;
- create a sense of local distinctiveness and enhance Rochester's tourist appeal; and
- provide clear guidance on delivery mechanisms for the development of the site.

It is intended that the development brief will be adopted as a Supplementary Planning Document by Medway Council after the completion of public consultation. The brief will provide planning and design guidance to developers and will inform development management decisions.

The SPD will supplement Policy S7 of the adopted 2003 Medway Local Plan that designates Rochester Riverside as an Action Area for redevelopment. The policy states that the 'comprehensive regeneration of the area will be sought in accordance with a development brief approved by the council'.

Policy S7: Rochester Riverside Action Area

The area of the Medway riverside north of Corporation Street, Rochester between Rochester Bridge and Doust Way, as defined on the proposals map, is designated as an Action Area.

The comprehensive regeneration of this area, over the next ten years, will be sought in accordance with a development brief approved by the council. Features which the Action Area is expected to provide include:

- *The development of approximately 1500-1800 dwellings including affordable housing, of which 300 to be completed by 2006.*
- *The provision of areas of open space and a riverside walk.*
- *A new river wall and reclamation in locations between the Shiplink (Limehouse Wharf) and Doust Way.*
- *The reservation of a site for a new primary school and the construction of other community activities.*
- *The creation of new leisure facilities and a hotel.*
- *Appropriate small-scale employment uses in use Classes B1 and B2.*

All new development will be expected to comply with the following principles:

- *comprehensive mixed-use redevelopment to maximise the potential for securing the regeneration of the whole area and its vicinity;*
- *a high standard of urban design and landscape, establishing it as a new quarter of the urban area;*
- *high quality mixed developments, appropriate to the location of this area close to both the riverside and historic Rochester; and*
- *the provision of good pedestrian and cycle links within the site and to historic Rochester and to the public transport network, including Rochester Railway Station.*

An ecological and hydrological appraisal of the impact of any development proposals will be required, particularly in relation to the construction of a new river wall on the mudflats and inter-tidal areas.

As an SPD, the development brief will define key principles and guidelines that will be adhered to and fully integrated into the design of a comprehensive and detailed schemes for individual phases of development.

In particular, a future masterplan for the site is to incorporate the following elements:

- *a mix of residential dwellings of which a proportion should be affordable (the provision of affordable housing should be in accordance with current adopted local planning policy);*
- *parking in accordance with a revised standard in keeping with the direction of guidance in the adopted interim standards. This should also include adequate parking either on site or close to the development for non-residential uses;*
- *a hotel;*
- *1.5 form entry primary school;*
- *a small scale food store that services the convenience needs of residents created by the new development;*
- *an appropriate level of non-residential commercial use including the Castleview Business Estate;*
- *public art;*
- *community facilities;*
- *a continuous river walk /cycleway;*
- *publicly accessible open space (including the river walk /cycleway and high quality public ream creating a destination in its own right) to meet the needs of residents, workers and visitors;*
- *natural open space (this should include a mix of inter-tidal habitat and terrestrial habitat in the form of trees, scrub and naturally managed grassland for the benefit of wildlife and people);*
- *a river wall 6.1m above ordinance datum at Newlyn and designed in accordance with Environmental Agency standards and PPG25;*
- *new gateway to the relocated Rochester Station from the development;*
- *measures to integrate the development with Rochester High Street (e.g. overcoming the severance caused by Corporation Street and the railway); and*
- *the replacement or retention of the following facilities:*
  - *an 18 space coach park with driver /visitor facilities;*
  - *public parking spaces within or ad jacent to the development; and*
  - *a market site.*

2004 Development Brief / 2006 masterplan

The vision for Rochester Riverside was established through the development of the 2004 Rochester Riverside Development Brief and subsequent approval in 2006 of the previous Masterplan.

The Development Brief establishes planning and design parameters for the development, including land use components, urban form, density, open space and sustainability. It outlines the previous use and history, the policy context and physical constraints.

The Brief was formally adopted as Supplementary Planning Guidance by Medway Council in June 2004. The principles, guidelines and aspirations as set out in the adopted Development Brief formed the basis of the Rochester Riverside Masterplan. The Masterplan reflected and responded to the aspirations of key stakeholders at the time and endeavored to set out the context for future development across the site. The Masterplan was based upon a number of urban design and development principles and sought to create a diverse and high quality environment for all.

The Masterplan envisaged a phased development, with the site split into five main phases, supporting a range of retail, leisure and tourism uses providing activity both day and night, including:

- A mix of up to 2,000 residential units, a proportion of which are affordable and live/work.
- Residential and non-residential parking, including a replacement coach park.
- Two hotels (one boutique), including conference and meeting room facilities.
- A centrally located two-form entry Primary School.
- A new entrance to Rochester Rail Station.
- A Waterfront Square with associated shops, restaurants and bars (A1, A3, A4, A5).
- Flexible commercial and office spaces (A2, B1).
- Local retail facilities (A1).
- Riverside walk.
- Publicly accessible open spaces.
- Upgraded site 'Gateways'.
- Community facilities including a new health centre.

The Masterplan, supported by a Transport Assessment and Environmental Impact Assessment, was granted Outline Planning Permission in June 2006 (ref. MC/04/2030) updated through permission reference MC/10/4613.

Further strategic policy documents were subsequently produced, linked to the Masterplan and its delivery, include the Landscape and Open Space Masterplan, a Gateway Study, and the Rochester Riverside Design Codes.

Masterplan review

The Outline Planning Permission for the Rochester Riverside scheme includes a requirement for cyclical reviews of the Masterplan. A review process is required in order to allow for a reflection of works already carried out on site, plus new and updated planning policies and design standards since the granting of the Outline Permission.

The first phase of development at Rochester Riverside has already been delivered through the completion of 73 affordable housing units, the creation of the Southern Gateway public square and the opening of the new river walk. The next phase of development 'Stanley Wharf' was released to the market in 2013 and a developer will be appointed in 2014. To ensure the success of the next and subsequent phases, the project partners (Medway Council and Homes and Communities Agency) must take forward a scheme that reflects economic realities and can be delivered within current design and planning standards. To support this objective, and to ensure the Council meets the review requirement of the Outline Planning Permission, in August 2013 the partners commissioned a complete review of the 2004 Rochester Riverside Development Brief and 2006 Masterplan.

In August 2013, the Council and Homes and Communities Agency appointed Allies and Morrison, a specialist urban design practice, to lead the review, with GL Hearn Ltd providing commercial and property advice. Allies and Morrison have produced a revised Rochester Riverside Development Brief and Masterplan which forms the basis of the rest of this document. As part of the review the following key issues have been considered and addressed:

The relocation of Rochester Station - Network Rail are currently constructing a new £26m rail station at the northern end of the Rochester Riverside site. It will provide longer platforms for larger trains to meet the needs of growing passenger numbers. The station will be in a new location approximately 0.5 km north of the current station and will link directly into Rochester Riverside forming a key element in the rationale for a revised masterplan.

Works completed to date - there has been significant public sector investment in the Rochester Riverside site. Over £90 million has been spent on site assembly, engineering works to raise the land, install new flood defences and a river wall. In 2013 the first homes were delivered on site - 73 affordable housing units - alongside a new public square and the opening of a new river walk. The next phase of development 'Stanley Wharf' was released to the market in 2013 and a developer will be appointed in 2014. Further funding has been made available to deliver additional infrastructure including the construction of the main spine road through the site.

Commercial viability and deliverability of elements of the approved scheme – specifically number and mix of residential units, commercial development, and public and residential parking.

Current planning and design standards/policies – parking standards, residential unit sizes, sustainability and innovative urban design.

The long-term economic sustainability and delivery of the proposed scheme. The revised Development Brief sets out the vision for a high quality residential living environment with a complimentary mix of uses. The Development Brief embraces a flexible and adaptable Masterplan that is capable of responding to market conditions and the need for a phased approach to development.

It is intended that the Development Brief and Masterplan will replace the previously adopted 2004 Rochester Riverside Development Brief and 2006 Masterplan. Once adopted as a Supplementary Planning Document (SPD), the Development Brief and Masterplan will become a material consideration in the determination of any planning applications for the Rochester Riverside scheme. The development of Rochester Riverside is estimated to take approximately 15 years and the plan will provide a consistent guide and framework for developers over this time period.

2006 masterplan

1.2 WHAT IS TO BE ACHIEVED?

Vision statement

The following vision statement outlines the key components and principles of the Rochester Riverside masterplan. Proposals will be expected to embrace this guidance:

Rochester Riverside will become a new neighbourhood and destination, occupying an attractive location on the River Medway. It will be well-connected to the existing historic heart of Rochester and the new railway station on Corporation Street. The proposals will create a new neighbourhood offering the best place in Medway to buy a new house.

The Development Brief embraces a flexible and adaptable masterplan framework which is capable of responding to evolving market conditions and the need for a phased approach to development. In doing so, the Development Brief defines a number of guiding principles and parameters which establish criteria capable of facilitating the creation of a successful, sustainable community. Proposals will be characterised by a high quality and diverse urban fabric and townscape, responding to views and connections to historic Rochester and the waterfront.

The masterplan draws precedent from successful neighbourhoods in historic parts of central Rochester. Although contemporary in design, the Development Brief promotes a simple, traditional approach to urban form in terms of legible streets and well-designed houses and non-residential buildings. The area will also benefit from a range of new parks and public spaces, an accessible route along an active, varied waterfront, and the delivery of other key amenities such as a new primary school, and local shops and community facilities. The area will provide up to 1,400 new residential units, primarily in the form of family housing with a wide variety of dwellings types and sizes, ranging from larger semi-detached units to maisonettes, terraced housing, mansion blocks, news houses and apartments. The exact housing mix will be influenced by the evolving needs of the area, and market conditions.

Rochester Riverside also offers an opportunity to broaden the central Rochester's commercial offer. The masterplan promotes a range of new uses including office space, a hotel and shops adjacent to the new station. Blue Boar Wharf will provide a unique waterfront setting for a high quality food and drink offer at the heart of the masterplan area.

View under the railway to the site

River Medway view

Views across the Medway

Gas House Road junction

First phase of development completed in 2013

Creeks

Distinctive crane at Blue Boar Wharf

Historic Rochester

1.3 STRUCTURE

The structure of the development brief is as follows:

- Chapter 2: description of the site;
- Chapter 3: overview of current planning policy context;
- Chapter 4: description of existing site constraints which takes into account recent site preparation work and the outcomes of recent technical studies;
- Chapter 5: overarching vision for the site alongside strategic guidance, design and place-making principles supported by illustrative material;
- Chapter 6: guidance for phasing and implementation; and
- Chapter 7: overview of next steps.

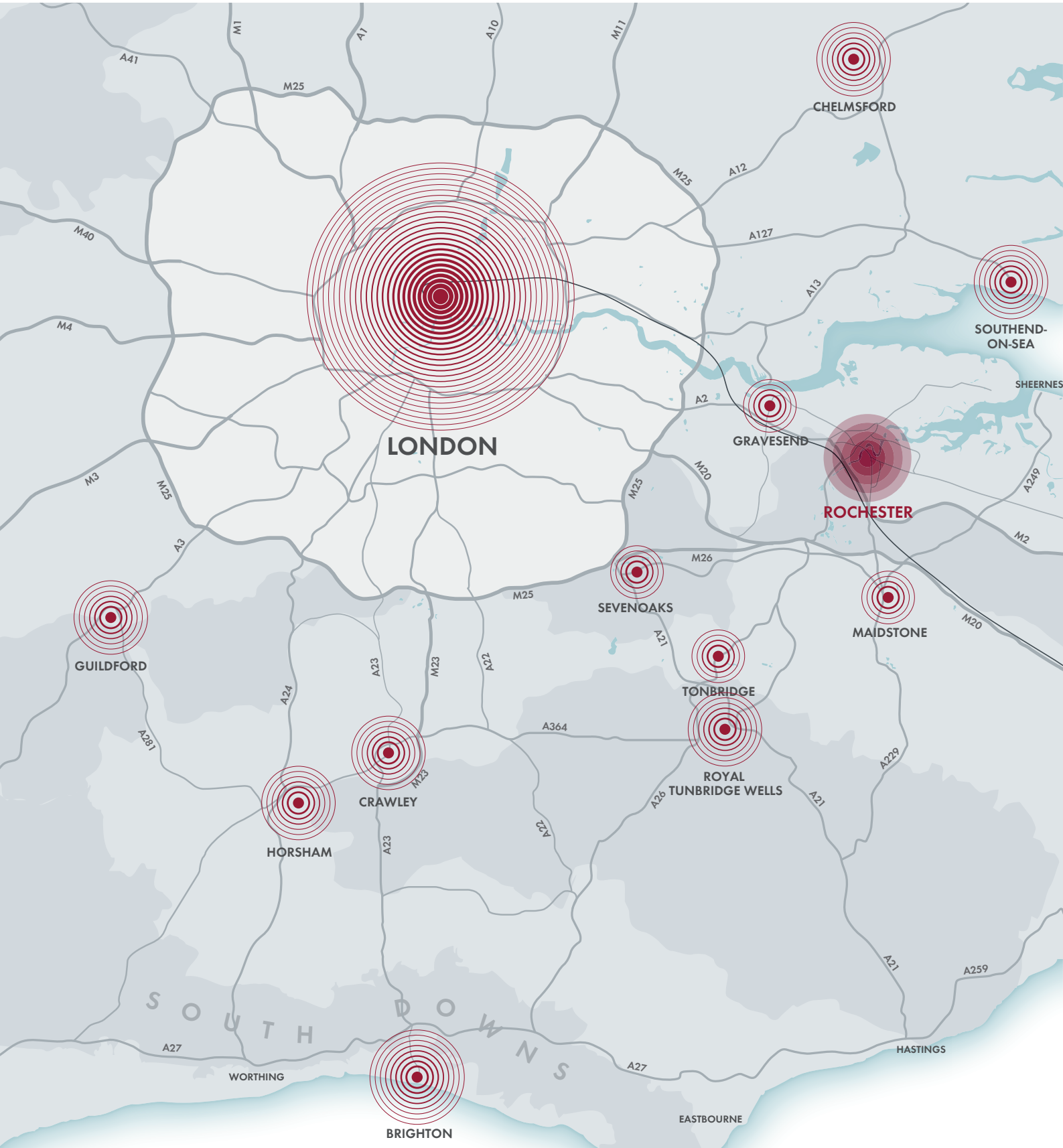
1.4 CONSULTATION

The Rochester Riverside Development Brief will be subject to a 6-week period of consultation in line with the adopted Medway Council Statement of Community Involvement. Following a detailed review of comments and responses, the Council will agree changes to the report and update the guidance accordingly.

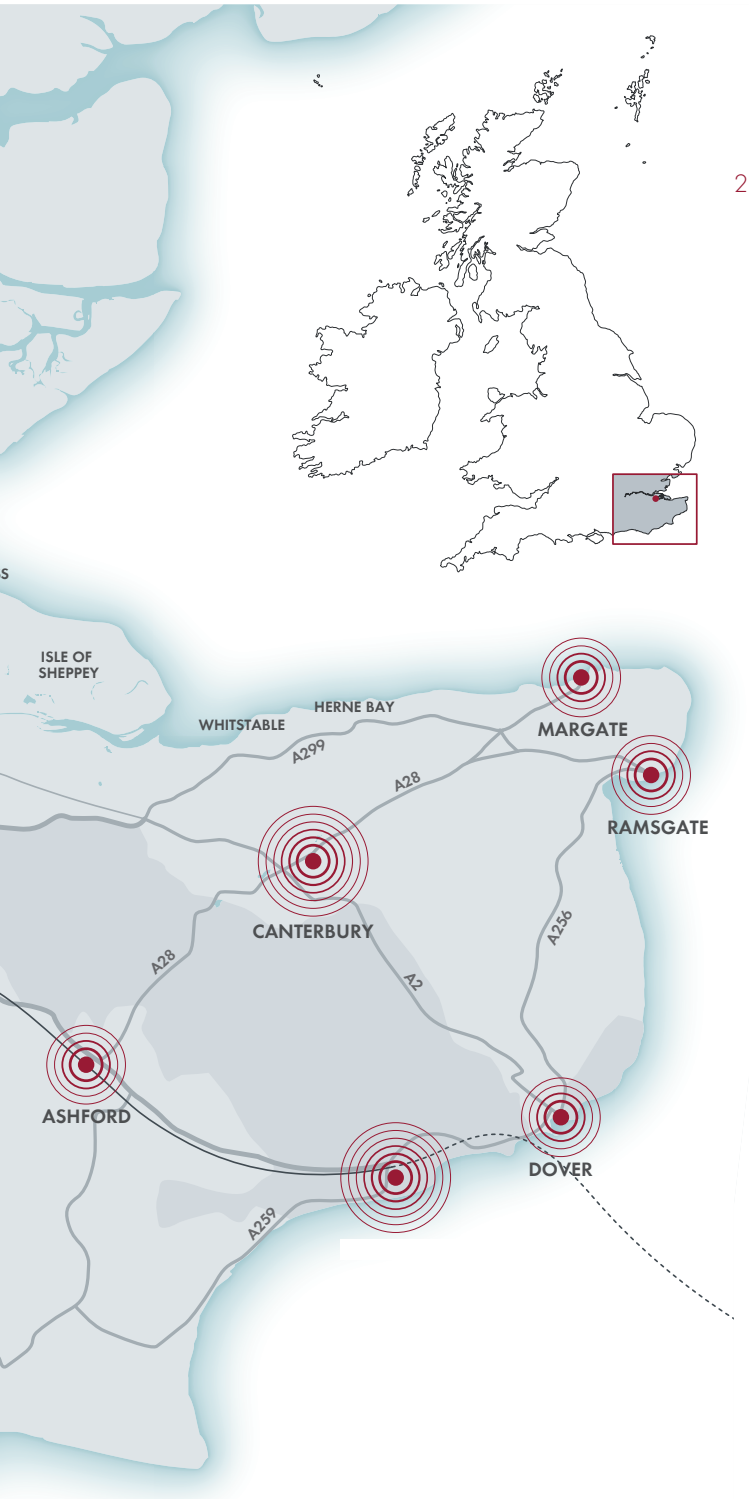
CHAPTER 2:

SITE DESCRIPTION

Rochester Riverside is a brownfield site adjacent to the River Medway and the historic city of Rochester. The site comprises some 32 hectares of mixed use and derelict land with a river frontage of approximately 0.75 miles.



Regional context – Rochester is situated in a highly accessible location on the High Speed Rail route to Kent with good road connections via the M2 motorway



2.1 STRATEGIC ROLE

Sub-regional position

The south east has been identified as the gateway to the rest of the UK due to its transport infrastructure, including six international airports, five international rail stations, six major ports and an extensive road, motorway and rail network, including the High Speed route. The Channel Tunnel has also enabled the region to become more open and accessible to Continental Europe. These key factors will help foster the further economic success and regeneration of the south east region.

The Thames Gateway area, which runs from East London through North Kent and South Essex and has unique potential due to its strategic location and a range of geographical, historic and economic assets.

The Medway area covers approximately 100 sq. miles and takes in the whole built up area of Medway along the north Kent coast.

The Medway area also consists of a large amount of attractive countryside, ranging from the North Downs through the Medway Valley to the marshes around the river estuary.

The Medway Towns benefit from a number of major historic assets including Chatham Historic Dockyard, the most complete Georgian Dockyard in the world, and the unique historic urban environment within the centre of Rochester including Rochester Castle, the Cathedral and the High Street. These historic areas are a focus for a growing hub of tourist activity and is a valuable strength of Rochester and Chatham in terms of attracting new investment to the area.

Rochester Riverside is identified as a 'main opportunity site' within the Thames Gateway Area. The site has the potential to play an

important role in creating an effective link between the historic city core and the riverside. The opening of a new station in 2015 is a major transformative project for the area.

Rochester is well located in terms of both road and rail connections to London, Canterbury and Dover. In particular the High Speed rail link has improved high speed train links between London and European Cities. Rochester,Chatham and Gillingham stations connect with international services at Ebbsfleet International Passenger Station via the North Kent Line.

There are a number of important elements that influence the emerging character of Rochester Riverside. These include:

- The River Medway – the river bounds the northern edge of the Medway towns and has a character of a working river.
- Rochester High Street - is a major focus for pedestrian and visitor activity and it is therefore vital that connections and views into and from Rochester Riverside respond to the historic context.
- Rochester Station - the new location of the station adjacent to the centre of the site and connections between Rochester, Ebbsfleet, Central London and Medway Towns will play a key role in maximising the development potential.
- Conservation area – Rochester's historic core including the key assets of the castle and cathedral require sensitive and careful integration in relation to the height, scale and massing of new development.

2.2 SITE LOCATION AND CHARACTER

Site location

Rochester Riverside is a brownfield site adjacent to the River Medway and the historic centre of Rochester. The site comprises some 32 hectares of some mixed use and derelict land with a river frontage of approximately 0.75 miles.

The main area of the site is bounded to the north and east by the River Medway, to the west by the operational railway tracks (London Victoria to Canterbury and the High Speed rail link from London St Pancras to Faversham) and to the south by residential development. Access into the site is currently achieved at two points off Corporation Street at Gas House Road and Blue Boar Lane, and at two points off the High Street at Furrell's Road and Doust Way.

Site characteristics

The preparation of the original Development Brief in 2004, and the subsequent outline application and masterplan for the site led to a number of major infrastructure and site preparation works. The area has three key areas of buildings as follows:

- Phase 1 development,south of Doust Way – recently completed, incorporating 73 affordable units including Extra Care accommodation.
- Castle View Business Park – these business units remain in active, viable use and play a key role in the local economy.
- Acorn Wharf shipyard – although outside of the core part of the Development Brief area, these warehouses have a distinct presence on the waterfront.

In addition to these built features, the area is also defined by a distinct set of creek environments which have been nurtured as green, ecological areas.

Further details on the urban character of the site are set out in chapter 5.

2.3 PROJECT BACKGROUND

Current regeneration context

Medway Council is currently progressing a number of parallel workstreams which will support the successful implementation of the masterplan. These are summarised as follows:

- Procurement of Stanley Wharf: The Council is currently marketing the first phase of development adjacent to the completed scheme to the south of Doust Way. The emerging illustrative masterplan and guidance in the Development Brief has been used to inform the Stanley Wharf brief and assess the tender responses.
- Creative High Street - the Council has been successful in bidding for £600,000 of grant funding (£300,000 capital and £300,000 revenue) from the Coastal Communities Fund. The project focuses on supporting the development of the creative industries in the 'creative quarter' between Chatham Waterfront and Rochester Riverside. The capital grant funding will be used to convert the redundant railway arches at Bath Hard Lane into creative workspace and incubation units for local creative businesses.
- Spine road, replacement coach park and long-stay car park: The Council is currently progressing detailed designs for the spine road linking Doust Way to Gas House Road and key car parking areas. These represent a key piece of infrastructure and are being carefully integrated with the emerging masterplan.

View towards Stanley Wharf which will be the second phase of development


EXPLORE MEDWAY
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CHAPTER 3:

PLANNING POLICY CONTEXT

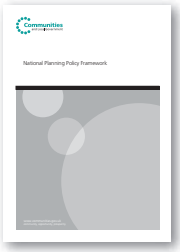
A hierarchy of planning policy and guidance documents governs the way in which land is developed and used. Policy is applied at the national and district scales. The relevant guidance is summarised in this section.

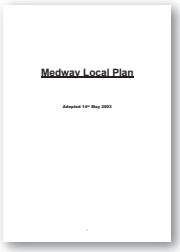
All development carrying forward as part of the future plans for Rochester Riverside will need to accord with new and updated planning policy as it emerges.

3.1 NATIONAL PLANNING POLICY

In March 2012 the government published the National Planning Policy Framework (NPPF), which replaced the existing suite of Planning Policy Guidance notes and Planning Policy Statements. The NPPF introduced a presumption in favour of sustainable development throughout the planning process, which requires that local planning authorities seek positive opportunities to meet the development needs of their area.

The NPPF's overall thrust is very similar to that of the Guidance notes and Statements that it replaced. Notably, the NPPF continues the government's emphasis on the effective reuse of brownfield land, promotes mixed-use developments and requires design excellence.





3.2 LOCAL PLANNING POLICY

At the local level a number of policy and guidance documents are relevant to the development of Rochester Riverside. Of particular relevance are the Medway Local Plan (2003) and the Kent Waste Local Plan (1998).

Although both documents are fairly dated, the NPPF requires that due weight should be given to existing plans according to their degree of consistency with its policies.

Medway Local Plan (2003)

The Medway Local Plan sets out the strategy, objectives and detailed policy for guiding development in Medway. The overarching development strategy for the plan area is to prioritise re-investment in the urban fabric. This is to include the redevelopment and recycling of under--used and derelict land within the urban area, with a focus on the Medway riverside areas and Chatham, Gillingham, Strood, Rochester and Rainham town centres, in accordance with Policy S1.

Policy S7 sets out the features that any development of Rochester Riverside is expected to provide:

- The development of approximately 1,500-1,800 dwellings including affordable housing
- The provision of areas of open space and a riverside walk
- A new river wall and reclamation in locations between the Shiplink site and Doust Way
- The reservation of a site for a new primary school and the construction of other community facilities
- The creation of new leisure facilities and a hotel
- Appropriate small-scale employment uses in Use Classes B1 and B2

Future proposals for development at Rochester Riverside should reflect and be in accordance with the principles for development set out in Policy S7. These are:

- Comprehensive mixed-use redevelopment to maximise the potential for securing the regeneration of the whole action area and its vicinity
- A high standard of urban design and landscape, establishing it as a new quarter of the urban area
- High quality mixed developments, appropriate to the location of this area close to both the riverside and historic Rochester
- The provision of good pedestrian and cycle links within the site and to historic Rochester and to the public transport network, including Rochester Railway Station
- An ecological and hydrological appraisal of the impact of any development proposals will be required, particularly in relation to the construction of a new river wall on the mudflats and intertidal areas

Policy S7 states that the comprehensive regeneration of Rochester Riverside will be sought in accordance with a development brief adopted by the council.

Policy S7 sets the overall strategic framework for Rochester Riverside. In addition, there are a number of detailed policies relevant to the site. These are as follows:

- **Policy ED2: Employment in Action Areas and Mixed Use Areas** – development will be permitted for business (B1) and general industry (B2) at Rochester Riverside. The location and extent of development will be determined in the development brief to be approved by the council.
- **Policy ED13: Hotels** – the development of hotels and associated facilities will be permitted within the Rochester Riverside Action Area.
- **Policy L11: Riverside Path and Cycleway** – a riverside path for use by pedestrians and cyclists will be developed on the south side of the River Medway, linking Gillingham Riverside Country Park to the Historic Dockyard, Rochester Riverside, the Esplanade and Baty's Marsh, Borstal. Development on sites fronting the river will not be permitted unless the proposals include a riverside walkway and cycleway, or it can be demonstrated that the operational needs of the development would prevent this.
- **Policy R9: Retail provision in new residential developments** – local shopping facilities within Use Classes A1, A2 and A3 at a small scale, appropriate to meet the daily needs of residents, workers and visitors, will be provided in association with the development of Rochester Riverside.
- **Policy CF6: Primary Schools** – land at Rochester Riverside is allocated for a new primary school. Development that would prejudice the implementation of these proposals will not be permitted.
- **Policy T10: Wharfs** – local planning policy seeks to protect the operation of wharves. However, the council will not protect wharves which are poorly served by good quality roads, such as those between Rochester Bridge and Chatham Town Centre. Local Plan policy specifically supports the expansion of Chathams Docks. This relates directly to Rochester Riverside, as paragraph 8.2.18 of the Medway Local Plan states that the expansion of Chatham Docks would allow wharfage at Rochester Riverside to be released. The wharves contained within the Rochester Riverside site are not protected for continued river-based activity.

Kent Waste Local Plan (1998)

The Kent Waste Management Plan was adopted in 1998. The objectives of the plan are to improve environmental standards, ensure capacity within the system for current and future waste management requirements and to move Kent towards the more sustainable disposal of waste. Following the expiration of a number of policies that were not saved beyond 27 September 2007, the Plan contains three policies that are relevant to the Rochester Riverside site.

Policy W7 identifies Blue Boar Wharf as one of 17 sites in the County which are considered suitable in principle for proposals to prepare Category A Waste (inert) for re-use. Proposals at other sites will be considered against a set of specified criteria.

Policy W8A deals with the disposal of dredgings from rivers, creeks, ports and mooring facilities. The Plan states (paragraph 5.2.14) that Medway Ports Ltd. currently disposes of about 53,000 m3 of maintenance dredgings each year. Disposal sites include Rushenden Marshes at Queenborough, Hoo Island and Barksore Marshes, which is within the Medway Marshes SSSI and SPA. Policy 8A therefore sets an order of priority for disposal of necessary dredged material. The policy focuses on the need to minimise dredging, to retain dredgings within the inter-tidal system, the use of dredging as a soil medium, landfill cover or building aggregate, and disposal in dedicated landfill sites, in that order of priority.

3.3 SUPPLEMENTARY POLICY & STANDARDS

A number of supplementary policy and standards documents, which are intended to supplement the development plan, are of relevance to the future development of Rochester Riverside.

Star Hill to Sun Pier Planning and Design Strategy Supplementary Planning Guidance (2004)

A small area to the south of the Rochester Riverside site lies within the Star Hill to Sun Pier Conservation Area. Star Hill to Sun Pier is a special and unique part of Medway that presents a series of challenges and opportunities. As such, there is a need to promote, shape and encourage development and regeneration that makes the most of the opportunities and character of the area. It is important to sustain its historic environment whilst giving it a new and appropriate economic future within the context of regenerated wider Medway Waterfront. The Star Hill to Sun Pier Planning and Design Strategy has been developed to provide guidelines and policies for the long term management and development of the Star Hill-Sun Pier area.

It is essential that the development of Rochester Riverside complements the objectives set out in the Strategy. The five strategic objectives are as follows:

- Reinforce the unique identity and historic character: securing the retention and restoration of the inherited abundance of historic buildings and architecture together with the protection and enhancement of urban structure that underpins the area's character. Enabling a high standard of design that sees the improvement of the riverfront and sympathetic development of gap sites.
- Produce a vibrant, mixed use place: developing a mixed–use economy, particularly along the High St, in order to create a vibrant, diverse, successful and safe place.
- Celebrate the public realm: creating an attractive and safe public realm based on its historic structure making the most of the area's riverside location. Restoration of historic alleys and establishment of a sensitive river frontage and riverside walk to be used by pedestrians and cyclists are key elements as are links to the green areas around Fort Pitt.
- Promote the riverfront: attracting people and activity to the riverside as a key asset, protecting and enhancing views of the river and developing a riverside walk as a safe and secure place.
- Produce a people-friendly place that is easy to get to, through and around: enhancing existing pedestrian and vehicular routes and creating new ones that are direct, safe and pedestrian focused.

A Building Height Policy for Medway Supplementary Planning Document (2006)

This document provides general location and design policy criteria for formulating and assessing proposals for tall buildings and identifies locations where tall buildings are and are not appropriate.

It is recognised that there is scope for tall, landmark buildings as part of the Rochester Riverside development; however, due to the sites proximity to historic Rochester and the River Medway, care would need to be taken to preserve identified vistas and views of the Castle and Cathedral.

Corporation Street Development Framework Supplementary Planning Document (2008)

The Corporation Street area is the main gateway between historic Rochester and Rochester

Riverside. The area is currently dominated by traffic, and suffers from derelictions and a poor sense of identity.

The vision for the Corporation Street area is defined as:

An elegant tree-lined street backed by fine new architecture which forms an attractive and efficient route between key areas of Medway. In its own right it will be an attractive place to live and work, or to walk or drive through. The new development, together with associated public realm improvements, will bolster the business and tourist economy of historic Rochester and link Rochester to the new community of Rochester Riverside.

Six objectives for the development of the area are set out:

- A form of development that reflects the character of central Rochester
- Integration of Rochester High Street and Rochester Riverside;
- Attractive and high quality publicly accessible open space and public realm;
- An active and vibrant environment that complements Rochester High Street and the land uses proposed for Rochester Riverside
- Improved street-level activity along Corporation Street, with a focus at Rochester Station
- Measures to reduce the severance caused by the railway embankment and Corporation Street

The Development Framework sets out design and planning principles for the area, including sites that are also included as part of the Rochester Riverside study area.

Medway Council Interim Residential Parking Standards (2010)

The council's interim housing standards set the minimum car and cycle parking spaces for new homes on the basis of size and also include a requirement for visitor car parking. However, there is an allowance for a reduction in the standard where a development is within an urban area that has good links to sustainable transport and where day-to-day facilities are within easy walking distance.

Medway Housing Standards (Interim) (2011)

The Housing Standards provides guidance in relation to the main design principles for new housing. These principles cover internal layout and minimum floor areas, outdoor amenity space, parking provision, and shared access and circulation.

3.4 OTHER POLICY

Other statutory and non-statutory documents also help to form the policy context for the development of Rochester Riverside.

Medway Waterfront Renaissance Strategy (2004)

The Medway Waterfront Renaissance Strategy sets the policy direction for the Medway Waterfront. It sets out the following:

- an overall development strategy for the waterfront
- a series of outcomes and actions to achieve the strategy objectives
- common themes and regeneration priorities linking the different areas
- the role of each individual area in relation to the waterfront and its development potential

For Rochester Riverside the following role is set:

Rochester Riverside offers a genuine opportunity to create a new riverside community at the heart of the waterfront that complements historic Rochester and opens up a significant length of the river frontage to public access.

The following aspirations and opportunities are set out for the Rochester Riverside site:

- create distinct area (sub-areas determined by new urban structure/ bridges/ embankment/ riverside and dominant land uses)
- ensure connection and integration within area by opening it up to historic Rochester, especially for pedestrians
- improve vitality east of Corporation Street and the railway embankment which acts as a barrier to views and movement
- develop a rich mixture of land uses (dominant and secondary) that includes significant housing, office, hotel/ conference centre, primary school and leisure/ local shopping complementary to historic Rochester functions
- retain and enhance setting of existing businesses of Castleview Business Estate, Acorn Shipyard and PB Printing
- realise potential for prestige riverside development
- improve access to and circulation within the area for pedestrian, public transport and private car (Gas House Road, Furrell's Road, Bath Hard Lane and Doust Way entrances)
- improve access and use of riverside via a river wall with land raising to avoid flooding
- provide a variety of public and private spaces for appropriate environmental, cultural and recreational uses building on prominent Gashouse Point and Bath Hard Wharf
- preserve and enhance views along riverside and to landmarks of Cathedral, Castle and Fort Amherst
- improve gateways to the area (emphasising symbolic potential of bridges and railway arches)
- encourage a more ingenious (and discrete) approach to car parking that responds positively to the issue of flood management

The Kent Design Guide (2005)

Produced by the Kent Design Initiative, which is a partnership consisting of a wide range of organisations including Kent's local authorities.

The purpose of the guide is to encourage well considered and contextually sympathetic schemes that create developments where people really want to live, work and enjoy life. It is aimed at a range of users including developers, built environment professionals, local authority members and officers, and community groups.

The Guide covers the entire design process from understanding the site context to planning.

Medway Regeneration Framework 2006-2016 (2006)

The Medway Regeneration Framework provides the strategic context for regeneration activity to 2016. Its vision is that the city of Medway in 2016 will boast:

- A major retail centre for the region
- A major university complex with 15,000 students
- A regional cultural offer
- Vibrant town centres with an active evening economy
- Efficient and integrated transport with fast links to London and Europe
- Lifelong learning opportunities
- A housing market of choice
- An employment market of choice and growing prosperity
- A learning and skills offer at all levels, available to all and appropriate to Medway's growing economy

Sustainable Community Strategy 2010-26 – City of Medway: rich heritage, great future (2010)

The Medway Local Strategic Partnership brings together all the main organisations representing the community including businesses, voluntary and community groups and public bodies such as the police, health service and council. These are the key stakeholders who can shape and develop the future of Medway. One of the main tasks of the Partnership is to consult local people and develop a long-term vision and supporting principles, as well as a plan of action to make that vision a reality.

The vision for Medway is made up of six ambitions and four key principles.

The six ambitions to be achieved over the next 16 years have been identified as:

- Medway to have a thriving, diverse and sustainable economy matched by an appropriately skilled workforce and supported by a higher and further education centre of excellence
- Every child to have a good start in life
- Medway residents to enjoy good health, well being and care
- Medway to have a safe and high quality environment
- Medway to be a place where people value one another, play an active part and have pride in their community and Medway as a whole
- Medway to be recognised as a destination for culture, heritage, sport and tourism

The four key principles which underpin the vision are:

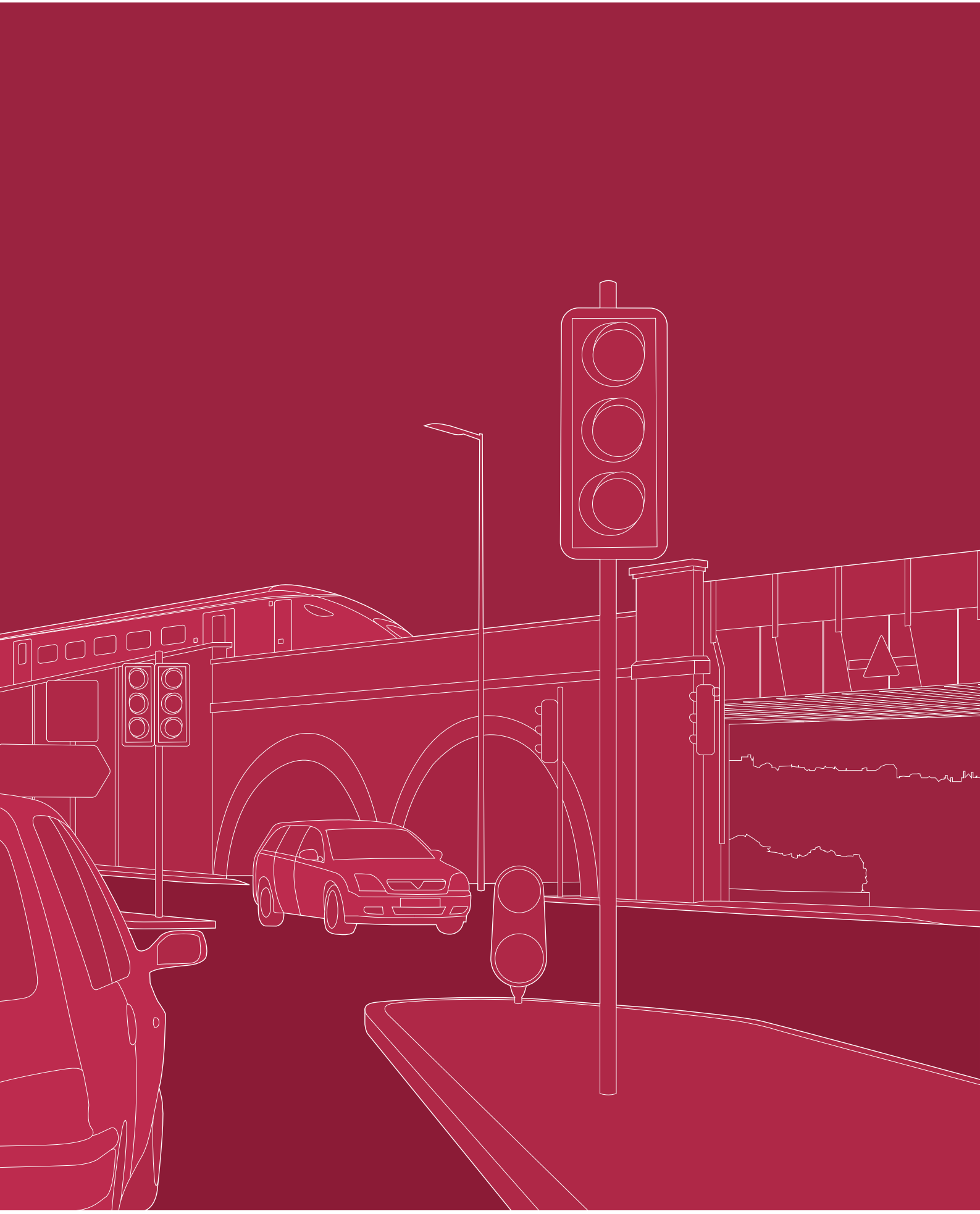
- Sustainability: will our actions work for tomorrow as well as today?
- Narrowing the gap: will our actions contribute to improving the lives of everyone so reducing the gap between deprived and more affluent areas?
- Fairness: do our actions take account of all sections of society, ensuring that everybody benefits from the regeneration of Medway?
- Self-help: will our actions encourage people to take responsibility themselves to make things better?

The Strategy includes a selection of actions and indicators for each ambition and guidelines for apply the four principles.

Medway Local Transport Plan 2011-2026 – Moving Forward Together (2011)

The Medway Local Transport Plan is closely aligned with the Sustainable Community Strategy and seeks to help address wider social, economic and environmental challenges for the area. The Plan's five overarching priorities focus on:

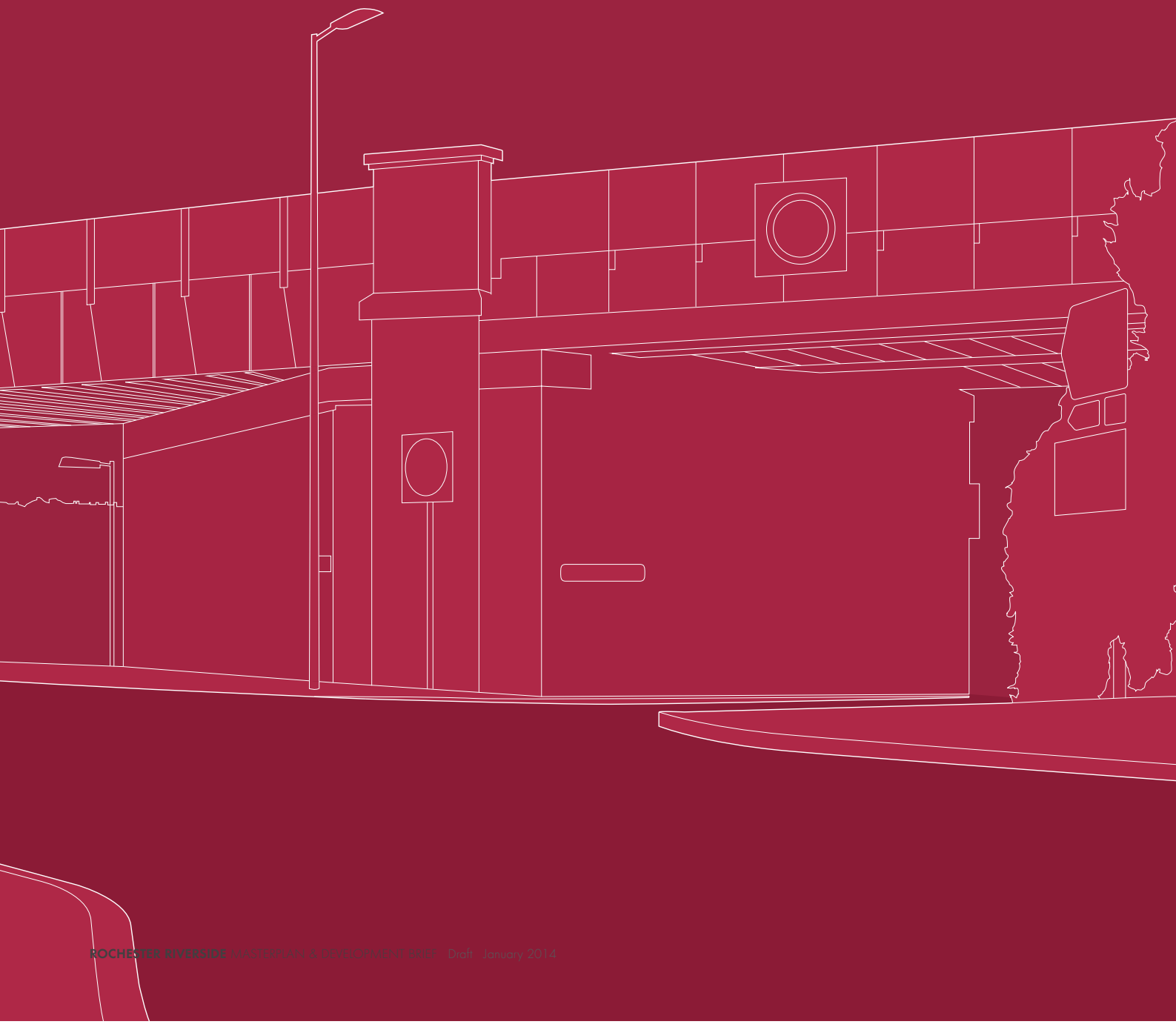
- Supporting Medway's regeneration, economic competitiveness and growth by securing a reliable and efficient local transport network
- Supporting a healthier natural environment by contributing to tackling climate change and improving air quality
- Ensuring Medway has good quality transport connections to key markets and major conurbations in Kent and London
- Supporting equality of opportunity to employment, education, goods and services for all residents in Medway
- Supporting a safer, healthier and more secure community in Medway by promoting active lifestyles and by reducing the risk of death, injury or ill health or being the victim of crime



CHAPTER 4:

SITE CONSTRAINTS

This section of the brief sets out the physical, design and environmental constraints specific to the Rochester Riverside site.



View of one of the distinctive creek edges

4.1 PHYSICAL AND DESIGN CONSTRAINTS

There are a number of physical and design constraints which need to be considered and taken into account whilst developing Rochester Riverside, including flooding, contamination and restricted access. The main physical and design constraints are as follows:

Flooding

Rochester Riverside fronts the River Medway. The majority of the site was low-lying, and lies in the flood plain of the River Medway. It was therefore necessary to raise the level of the site to above the 1:200 flood level, as was specified by the Environment Agency (EA) at the time the site preparatory engineering works were undertaken. The 1:200 flood level in the Medway area was then predicted to be +5.5m AOD and the EA required a minimum of 300mm freeboard for the flood defences and developable area. The site levels have therefore generally been raised to an approximate level of +5.8m AOD. Thresholds of buildings and internal ground floors were required by the EA to be at a level of +6.1m AOD, (600mm above the 1:200 flood level).

At some locations the temporary river walk has been finished to a level of +5.3m AOD. These lengths of river walk are where the original masterplan submitted with the outline planning application intended for the adjacent development blocks to have underground car parking. The lower level of the river walk in these locations was to allow some natural ventilation to the car parks. Also, in the Furrell's Wharf area the river wall and adjacent river walk was finished at a level of +4.5m AOD. This is to provide a waterfront open space close to river level.

Subsequent to the preparatory engineering works, the Environment Agency advised that the Thames Estuary 2100 (TE2100) Study requires minimum site levels to be raised to +6.1m and accordingly floor levels of all habitable properties to be +6.4m AOD.

As part of the preparatory engineering works the flood defences were replaced, primarily by sheet piled walling with certain lengths being anchored via various means of anchorage systems (ground anchors, cofferdam construction and piled anchor beams). A 10m zone directly adjacent to the river wall excluding the construction of buildings and other permanent structures is required to be maintained to provide access to the EA for emergency repairs and maintenance. The river wall construction is generally within this 10m zone, with the exception being ground anchors used on some sections of the river wall. The ground anchors will need to be taken into account if piling for development is required adjacent to these sections of river wall and anchor as-built records are available to assist in identifying anchor locations.

A section of the flood defences at Furrell's Wharf are formed by landraising earthworks. The Furrell's Wharf area includes an area of land that is constructed below flood level, ranging in level from 5.8m AOD to the west flood defence boundary down to a minimum of +4.5m AOD adjacent to the river wall. It is anticipated that this area will flood occasionally and therefore will need to be planted with saline tolerant species.

Ground Conditions

The site has undergone significant land use change over the past 200 years. In the early 1800's the site was predominantly marshland with little or no development. Since the mid 1800's the site has undergone significant reclamation, including land raising and construction, mainly for industrial use.

The original ground conditions at the site before the preparatory engineering works were undertaken consisted of a variety of made ground with depths varying in thickness from less than 0.5m and up to 6.0m. The made ground overlies a soft clay I silt Alluvium up to 12m thick, containing layers of peat. The Alluvium overlies River Terrace Gravel varying in thickness, typically between 0.5m and 8.5m, which overlies a chalk bedrock to a significant depth below the site.

The land raising for the preparatory engineering works was achieved by the importation of dredged sand from the Thames Estuary. Due to the nature of the subsurface material below the made ground, significant settlement following the land raise was anticipated. Consequently ground improvement works were undertaken; in summary, this comprised pre-consolidation of the underlying compressible alluvial soils through the installation of PVD (vertical band) drains and application of surcharge. Residual secondary settlement is expected to occur over the areas of the site that have been land raised.

Land Contamination

The environmental remediation of the site formed one of the most significant parts of the preparatory engineering works undertaken on the site and included treatment of contaminated soils and groundwater, and the provision of a capping layer of granular material across the site.

The site was divided into two sections for the purposes of the remediation works, characterised by the previous use:

- Section 1 – mixed industrial development including asbestos-related manufacture
- Section 2 – long-established production and storage of gas

The development of remediation methods and targets for the remediation programme was covered by the approved Remediation Implementation Plans for the two sections and the execution and validation of the remediation works was covered by the Validation Reports for the two sections.

There are a number of remediation requirements that are likely to be associated with the proposed development of the site. These items were not undertaken as part of the preparatory works. However, they will be required for the final development of the site.

Such items include, but are not limited to:

- Design and provision of gas protection measures
- Design of buried concrete for potentially aggressive conditions
- Design of underground services appropriate for the ground conditions in which they are placed
- Importation of subsoil and topsoil for proposed domestic gardens and areas of soft landscaping
- Adequate chalk aquifer protection measures in accordance with Environment Agency guidelines are to be implemented when designing and installing boreholes and piling

Notifiable Installations

Certain sites and pipelines are designated as notifiable installations by virtue of the quantities of hazardous substance present. The siting of such installations will be subject to planning controls, for example under the Planning (Hazardous Substances) Regulations 1992, aimed at keeping these separated from other development. In accordance with Department for Communities and Local Government NPPG: Hazordous Substances, the Local Planning Authority will consult the Health and Safety Executive (HSE), as appropriate, about the siting of any proposed notifiable installations.

Rochester Riverside already contains a number of installations handling notifiable substances, including pipelines. Whilst they are subject to stringent controls under existing health and safety legislation, it is considered prudent to control the kinds of development permitted in the vicinity of these installations. For this reason the Local Planning Authority has been advised by the HSE of consultation distances for each of these installations. In determining whether or not to grant planning permission for a proposed development within these consultation distances the Local Planning Authority will consult the HSE about risks to the proposed development from the notifiable installation in accordance with NPPG: Hazardous Substances.

Gas House Road

Blue Boar Lane

Bath Hard is now pedestrianised

Furrell's Road from Bardell Terrace

Restricted Access

The Rochester Riverside site has a long history of uses which relied on access to the river for their existence. Rapid industrialisation of the site and its wider area began in the 19th Century together with the construction of two railway lines. These served to effectively separate Rochester city centre from the riverside. Rochester Riverside has been dependent on four historic routes under the rail embankment, one of which is now closed to vehicles and has been replaced by a new road. Vehicular access into the site is currently achieved at two points off Corporation Street and two off Rochester High Street. Three of the existing accesses are sub-standard not only in height but also in width or alignment. Details of these three entry points are:

Access Point: Gas House Road
Height: 4.5m
Width: 9.0m
Note: approach alignments cause HGVs to use opposing lanes

Access Point: Blue Boar Lane
Height: 3.1m
Width: 9.0m

Access Point: Furrell's Road
Height: 4.4m
Width: 9.0m
Note: entry radius from Bardell Terrace too small for HGVs

As mentioned above, Bath Hard is no longer a vehicular access point to the site, as it was pedestrianised when the first phase of the previous masterplan for site was developed.

Doust Way is newly constructed and provides vehicular access to this same phase of development. It has a width of 7.3 metres, no height restrictions and would allow HGVs to enter the site.

Any future work carried out as part of the proposals to improve access to the site must not have an adverse impact on Network Rail's infrastructure.

Doust Way

Looking back to the historic heart of Rochester

Archaeology

A series of archaeological investigations were undertaken between November 2004 and March 2007 at Rochester Riverside site including evaluations, watching briefs and open area excavations.

In brief summary, the results of these investigations identified that in the northwest area of the site the remains of the Roman town wall and a number of cut features exist. In the southern area of the site were several burials of probable Roman date. Medieval features included the wall of a masonry structure, rubbish pits and dumped material. Viking presence on the site is attested by a single piece of residual metalwork. Much of the site consisted of marshes until the 19th century, and late post-medieval dump deposits associated with the reclamation of the site sealed a sequence of alluvial deposits. A number of post-medieval structures were recorded, including an 18th century causeway, docks, and a Customs Watch Tower. The remains of several river barges were identified re-used in the foundations of a 19th century rail depot.

These archaeological investigations were used to discharge the relevant planning conditions attached to the planning permissions for the preparatory engineering works and the first phase of development related to the previous masterplan.

There are no scheduled ancient monuments, registered battlefields, registered historic parks or gardens, protected wreck sites, special areas of conservation, heritage court or world heritage sites located within the boundary of the Rochester Riverside site.

Numerous monuments in adjacent historic Rochester are designated as Grade I, II* and II listed buildings and / or schedule ancient monuments. The design of future development and its environmental impact will need to take account of the setting and context of these statutory designations.

Views and Vistas

Long distance views of Rochester castle and cathedral can be gained from the north and east of the River Medway with middle distance views available from within the body of the site. There is an important vista, which crosses the southern part of the site, leading from Rochester Castle to Chatham waterfront and war memorial. The site is visible in varying degrees in the north and east.

View from the castle to the cathedral and site

4.2 ENVIRONMENTAL CONSTRAINTS

Under the Town and Country Planning (Environmental Impact Assessment) England and Wales) Regulations 2011, a planning application submitted for the site is to be accompanied by an Environmental Impact Assessment (EIA).

Particular consideration should be given to the following environmental constraints and issues:

Biodiversity

The development proposals should seek to achieve no net loss of intertidal habitat in line with Environment Agency guidelines. The new flood defences were generally established at the same position or behind the previous defences in order to retain existing (uncovered) inter-tidal zones. To mitigate intertidal habitat below the previous wharf structures, two new creeks have been created. The quality and diversity of intertidal habitat has been increased by incorporating saltmarsh terraces as part of the waterfront treatment. Saltmarsh terraces should step down to the mudflats and be at an elevation that allows periodic inundation from high tides and native saltmarsh vegetation to establish.

Site planning and design should, where practical, make provision for wild life habitats as part of a wider network of wildlife corridors or stepping stones in the area. This would be best achieved as part of the green open space network which should incorporate elements of habitat creation, such as wildflower grassland, wetlands, native hedgerows, and native tree planting, to compensate for a range of common but diverse plant communities lost to development.

Common reptiles may occur at the site and further surveys are required to establish this. Although their habitat is not directly protected there is a legal obligation to undertake reasonable effort in removing reptiles from a site where there is a risk of causing them harm. This will mean an area of suitable habitat would need to be conserved or created in the proposed open space network as a receptor site for translocated animals.

As part of the environmental assessment of future development a phase one habitat survey should be carried out as well as a survey of the birds that currently use the site. Particular care should be taken in assessing areas of inter-tidal habitat and assessing where present flood defences have acquired ecological value. These areas should be retained wherever possible and should be taken into account when positioning any future jetties, marinas, moorings or similar.

Noise levels

Noise levels from the railway, Acorn Shipyard and other industrial uses along the River Medway will impact on the amenity of new residents and other users of Rochester Riverside. Attenuation measures may be necessary and innovative design solutions sought. A number of measures can be introduced to control the source of, or limit exposure to, noise.

The detailed design of proposals must ensure that, as far as is practicable, noise-sensitive developments are located away from existing sources of significant noise. Planning conditions may be imposed to ensure that the effects of noise are mitigated, as far as possible. These should be in accordance with best practice design / techniques.

Utilities

There are a number of existing surface water sewers within the site that serve catchment area beyond the site boundary and outfall to the River Medway. These are adopted by local sewerage authority and must be protected or diverted as part of detailed development proposals. The

details will need to be considered once a detailed layout becomes available.

Significant off site foul drainage and electrical supply improvement are required to provide adequate capacity for the future developments. Any development proposals should include f or phased provision of infrastructure to serve new developments.

Visual Impact

A number of important views and vistas exist within and through the Rochester Riverside site. In particular, there are sensitive and important views of Rochester Castle and Cathedral. A comprehensive visual impact analysis/assessment needs to take place for all development proposals coming forward as part of the Rochester Riverside site.

The waterfront has an unique setting and biodiversity

Acoustic impact of the adjacent railway line requires early assessment

Views to the cathedral are a key consideration in relation to visual impact

CHAPTER 5:

DESIGN GUIDANCE

Rochester Riverside will become a new neighbourhood and destination, occupying an attractive location on the River Medway.

High Street

Historic Core

Open Spaces

Waterfront

Castle and Cathedral

Watts Avenue

Maidstone Road

5.1 DESIGN VISION

The following vision statement outlines the key components and principles of the Rochester Riverside masterplan. Proposals will be expected to embrace this guidance:

Rochester Riverside will become a new neighbourhood and destination, occupying an attractive location on the River Medway. It will be well-connected to the existing historic heart of Rochester and the new railway station on Corporation Street. The proposals will create a new neighbourhood offering the best place in Medway to buy a new house.

The Development Brief embraces a flexible and adaptable masterplan framework which is capable of responding to evolving market conditions and the need for a phased approach to development. In doing so, the Development Brief defines a number of guiding principles and parameters which establish criteria capable of facilitating the creation of a successful, sustainable community. Proposals will be characterised by a high quality and diverse urban fabric and townscape, responding to views and connections to historic Rochester and the waterfront.

The masterplan draws precedent from successful neighbourhoods in historic parts of central Rochester. Although contemporary in design, the Development Brief promotes a simple, traditional approach to urban form in terms of legible streets and well-designed houses and non-residential buildings. The area will also benefit from a range of new parks and public spaces, an accessible route along an active, varied waterfront, and the delivery of other key amenities such as a new primary school, and local shops and community facilities.

The area will provide up to 1,400 new residential units, primarily in the form of family housing with a wide variety of dwellings types and sizes, ranging from larger semi-detached units to maisonettes, terraced housing, mansion blocks, mews houses and apartments. The exact housing mix will be influenced by the evolving needs of the area, and market conditions.

Rochester Riverside also offers an opportunity to broaden the central Rochester's commercial offer. The masterplan promotes a range of new uses including office space, a hotel and shops adjacent to the new station. Blue Boar Wharf will provide a unique waterfront setting for a high quality food and drink offer at the heart of the masterplan area.

6.2 THE FRAMEWORK

The following series of plans summarise the key design moves and principles which have informed the development of the masterplan:

1. Respond to the assets

An important starting point for the masteplan, and subsequent more detailed proposals is to ensure that the masterplan responds to the assets which characterise historic Rochester and the wider riverside setting. Central Rochester is situated entirely within an amalgamated Conservation Area, with views and vistas dominated by the cathedral and castle. The topography of the town, and imposing scale of the cathedral and castle mean that these historic assets are frequently visible from the riverside area. The High Street also forms an important historic feature, with its distinctive grain, scale and townscape giving the town centre a strong sense of historic continuity.

High Street, Castle, Cathedral and Conservation Area

2. Overcome the barriers

Rochester Riverside experiences a strong sense of physical separation from the historic central area. Two parallel transport corridors sever the riverside area from the main town centre in the form of the A2 and the Chatham mainline railway route. Corporation Street (the A2) comprises four lanes of fast-moving traffic, book-ended by vehicle-dominated junctions at either end of the High Street; the Star Hill mini-gyratory system to the south, and the junction with the High Street to the north. The lack of pedestrian connections between the High Street and Rochester Riverside is exacerbated by the loose arrangement of buildings on Corporation Street and the poor definition and enclosure of public and private space.

Although the railway forms a physical barrier to movement between the riverside area and historic Rochester, the railway's elevation means that a number of connections exist through railway arches along the length of the viaduct, giving a reasonably strong sense of permeability.

The masterplan seeks to overcome these barriers by establishing a conceptual framework of connections which responds to the street pattern of central Rochester, effectively extending the historic grain to Rochester Riverside.

Railway and A2

3. Establishing streets and urban grain

A principle objective is to establish a clear structure of east-west connections between the historic town centre and Rochester Riverside, responding to existing links off the High Street and improving crossings and connections across Corporation Street. In order to embed this sense of integration between Rochester and the waterfront, the masterplan seeks to extend this east-west grain, forming the basis of an enduring and successful network of residential streets leading to the waterfront.

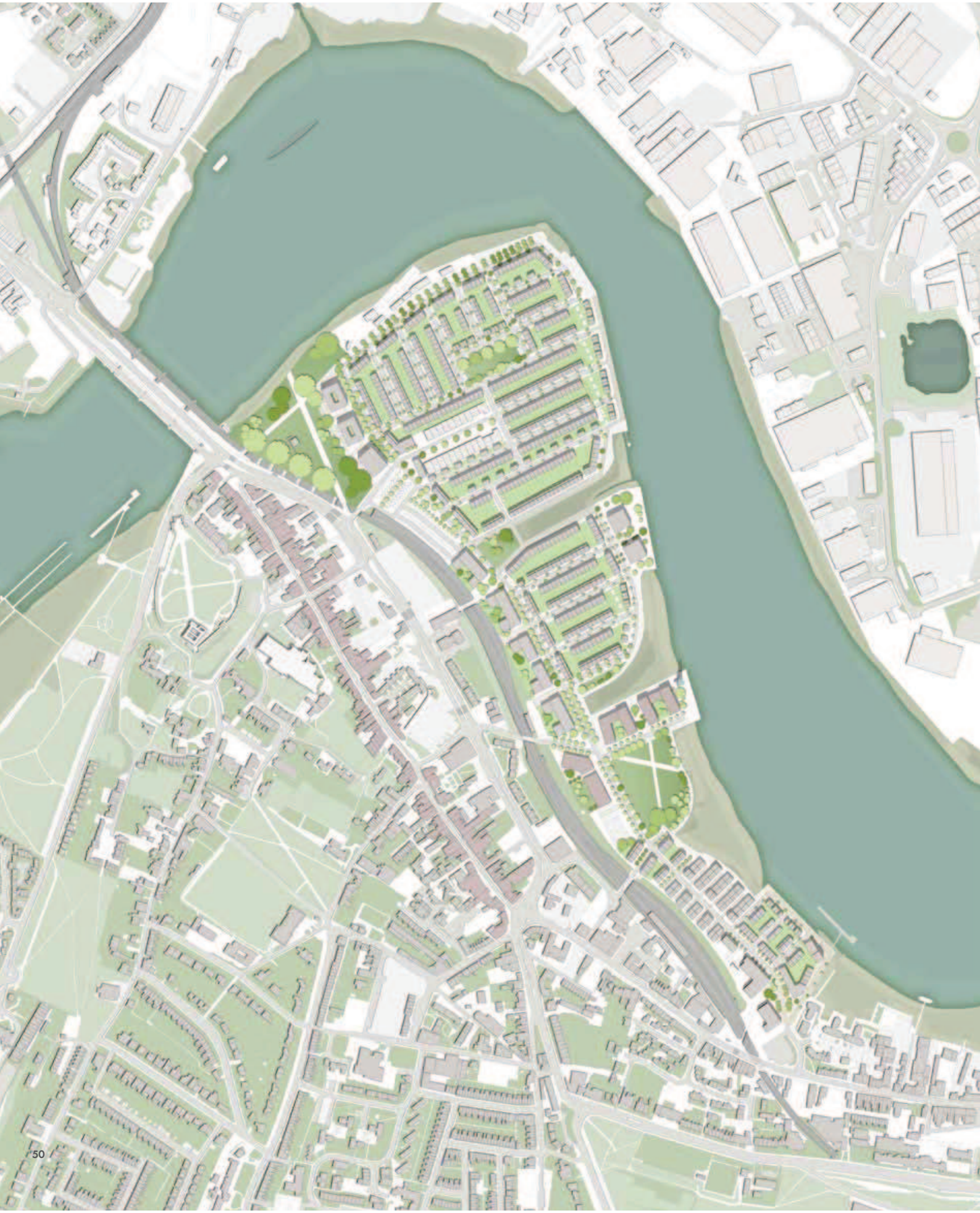
The distinctive geography of Rochester Riverside helps to define a series of distinct urban blocks which mirror the grain and scale of Rochester's residential neighbourhoods to the west of the High Street. A more detailed phase of masterplanning work has assisted in the development of more refined street network and finer grain block structure in response to the broad creation of east-west and north-south streets.

East-west grain and connectivity

4. Embrace wider opportunities

The development of Rochester Riverside will facilitate the regeneration of the Corporation Street area. The context for this is already established in the Corporation Street SPD, but the renewed energy kindled by the revised masterplan will be a catalyst for a range of public realm, highways and development opportunities to transform this important corridor. In addition to immediate enhancements of the points of threshold between Corporation Street and Rochester Riverside, the masterplan will also seek to encourage projects to achieve improved connectivity on the High Street side of Corporation Street, making walking routes more welcoming.

Corporation Street opportunity sites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5.3 DESIGN GUIDANCE

5.3.1 ILLUSTRATIVE MASTERPLAN

The adjacent roof plan provides an illustration of how the broad masterplan principles identified in section 5.2 could be applied. Proposals should adhere to the following key design principles as follows:

1. Well-designed streets and houses – a distinctive Rochester neighbourhood

Proposals should promote streets and residential dwellings as the fundamental building blocks of the masterplan. The shift from the 2004 apartment-led approach to a housing-led masterplan resonates with the existing character of neighbourhoods south of the High Street.

The masterplan's emphasis on streets, spaces and housing creates a consistent approach in grain, but also allows for architectural variety and diversity, an attribute that mirrors the neighbourhoods south of the High Street. Diversity of materials and housing design will help to generate a varied urban character and sense of place throughout Rochester Riverside.

2. Views and connections to historic Rochester and the waterfront

The masterplan proposals seek to strengthen and nurture a dominant east-west grain, maximising connectivity to the waterfront and the existing town centre. Streets and spaces respond to existing desire lines and also seek to strengthen physical connections and visual links. A strong north-south connection will unify the creeks and neighbourhoods, running parallel to the High Street, A2, railway viaduct and water.

The framework of spaces and streets maximises opportunities to connect back to the water, ensuring that all residents and visitors have a strong sense of being by the riverside. The emphasis on connections to the waterfront is supported by a sensitive approach to scale and

Existing and riverside grain

Views and connections

massing along the water's edge. Buildings on the waterfront will accommodate connections and views to the water, through a permeable layout, and a typical height of four storeys. This approach will establish an appropriate degree of intensity and enclosure to the waterfront, achieving public access and a clear delineation of space. The masterplan avoids scenarios in which buildings have an overbearing presence, block views or create ambiguity in relation to the legibility of public and private space.

Although a corridor of slightly taller buildings is appropriate along the raised viaduct of the railway line, the masterplan encourages careful consideration of local views and vistas, particularly those to the castle and cathedral.

3. Clusters of commercial, cultural and communal activity

The masterplan has been informed by a robust understanding of current market dynamics and trends. In this context, the proposals incorporate a modest proportion of non-residential activities which will enliven the riverside and ensure it is a popular and sustainable place to live and work. Commercial, community and cultural uses have been carefully clustered to establish a critical mass of activities in key locations. This will help to nurture successful, viable locations for businesses and other services and amenities. The high street must be protected as the commercial heart of Rochester.

4. A varied, active waterfront

The waterfront edge will have a varied form and character, with the precise arrangement of building typologies and uses shifting along the perimeter of the site. The exact form of enclosure and character of public space and townscape will help to define a series of different places and destinations – some with a predominantly domestic character, and others with a greater

Non-residential hubs

Varied waterfront

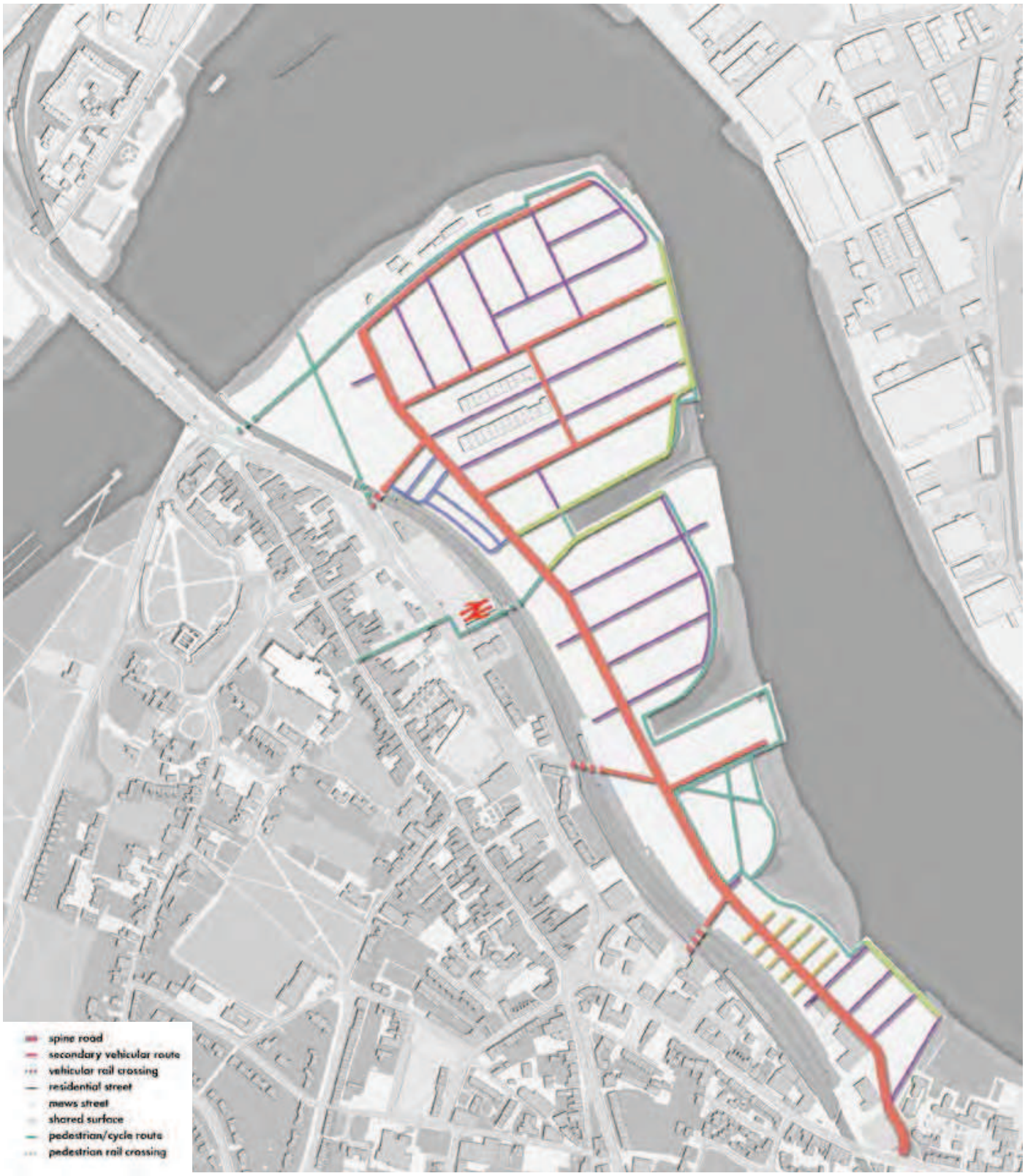
emphasis on cultural or commercial activities.

An important shift from the previous masterplan is the creation of a busier waterfront, including vehicular access along a significant proportion of the water's edge. The presence of vehicles on the waterfront will help to create a sense of life and activity, and will also provide access to residents overlooking the Medway. Proposals will maintain segregated access to the riverfront walk for pedestrians and cyclists. Careful management of streets will ensure that road access is intermittent – there will not be a continuous vehicular route along the length of the waterfront, thus allowing access for individual properties, but avoiding any sense of vehicular dominance.

Flexible plots

5. Flexibility and deliverability

The previous masterplan was a product of prevailing market conditions which led to an emphasis on smaller, flatted accommodation. Although the initial phase of development has been successfully implemented, the development parameters in the consented 2004 masterplan do not allow sufficient flexibility to adjust the balance of housing and apartments. In that context, the current masterplan seeks to introduce a more flexible approach to allow a range of different typologies and detailed design solutions to come forward over the lifetime of the project within the overall framework of streets and spaces. This approach prioritises deliverability and would allow individual phases of development to respond to current patterns of demand, and to feel like "completed" places in their own right.



Routes and movement

5.3.2 ROUTES AND MOVEMENT

Development proposals will be required to respond to, and deliver a legible network of routes and connections facilitating ease of movement for all forms of transport as set out below:

Connections to town and station

Rochester Riverside is extremely accessible, situated within easy walking distance of the town centre and the new railway station. The station will be located at a central point at the edge of the masterplan area, providing excellent local access to Rochester alongside frequent services to London Victoria on the Chatham Main Line operated by South Eastern, and regular services to London St Pancras International via Ebbsfleet International on the High Speed 1 line.

In this context, pedestrian and cycle connectivity is a major priority. Proposals will be expected to deliver a number of pedestrian / cycle only routes including routes along the waterfront and through public spaces. The cycling and walking diagram highlights that the whole waterfront benefits from a pedestrian / cycle route which is largely segregated from other forms of transport. Walking and cycling connections back to the railway / town centre should also be achieved along tertiary routes and shared surface streets.

Vehicles

Proposals should be based on a layout which accommodates a network of streets, and defines a hierarchy of connections through the site. The primary connection is the north-south route which links back into the wider Rochester network at Gas House Road and Doust Way. This route will perform a predominantly local function, connecting the new neighbourhoods and commercial destinations into Rochester, without generating through-traffic or rat running.

Proposals should facilitate an accessible waterfront for vehicles, allowing access and egress to individual properties. Highways proposals should respond to the masterplan which has been carefully arranged to ensure that vehicles cannot drive the full perimeter of the waterfront. The design of streets, spaces and buildings should facilitate the changing character of the route along its length. Proposals should make reference to the masterplan in defining areas of shared surface, parking and diversionary cut backs where vehicles deviate away from the waterfront at appropriate intervals.

Coaches and railway access

The Gas House Road entrance will play a key role for vehicles in relation to the location of the proposed visitor coach park and long stay car park within easy walking distance of the town centre and railway station.

1 Farrell's Park
2 Acorn Park
3 Acorn Wharf
4 Cory Square
5 Blue Boar Wharf
6 Doust Square
7 Limehouse Gardens
8 Cory Wharf Gardens

Open Spaces

5.3.3 OPEN SPACES

Public parks

Neighbourhood spaces

Local places

The provision of accessible, successful spaces is a major priority. Proposals should be proactive in responding to the arrangement of spaces in the illustrative masterplan and securing sufficient formal and informal open space and play space for young people. The Council will expect development proposals to deliver a range of spaces with a variety of functions and activities. The adjacent plan illustrates the proposed open space locations at a wider scale, which aids comparison with existing green spaces in Rochester.

Public parks

The masterplan defines two major public spaces situated at the north and south of Rochester Riverside.

To the north, Acorn Park occupies an important position at the northern part of the riverside. The location attempts to extend the riverside park (The Esplanade and castle grounds) which form a tranquil corridor alongside historic Rochester. Acorn Park will form an important destination which will encourage visitors and residents to cross Corporation Street, helping to extend the reach of the High Street to the riverside, including the potential cluster of cultural and commercial activities at Acorn Wharf.

Both public spaces mirror the character of existing town centre parks and spaces such as The Vines, by defining legible paths and connections which extend the urban grain and respond to existing views, connections, streets and points of threshold under the railway viaduct.

To the south, Furrell's Park offers an attractive space with pleasant views along the Medway. Picking up on the desire line to the town centre, Furrell's Park is extremely accessible, boasting a number of interesting adjacent activities including food and beverage offer at Blue Boar Wharf, the new primary school to the east, and a mix of different housing typologies to the north and south.

Neighbourhood spaces

Although not a formal open space per se, a number of waterfront locations should be designed as more informal routes and destinations to walk, cycle, exercise and relax. These include Acorn Wharf, the creeks and adjacent spaces at Cory Wharf and Blue Boar Wharf, and the waterfront routes at Limehouse Wharf and Stanley Wharf.

Local places

Proposals should incorporate opportunities for local spaces including those illustrated on the adjacent plan. Limehouse Gardens echoes the traditional form of many fashionable London estates, although in this case it is intended that the square would be accessible to the public as well as residents.

The square at Doust Way was conceived at the time of the original masterplan, with part of the space enclosed by the first phase of development to the west of Doust Way and laid out as a shared surface. Proposals should define a suitable edge to the north-east of the shared space area which will complete the square and mark the connection to the waterfront adjacent to Stanley Wharf, the next phase of development.

A small local space should be delivered at the western end of Cory Wharf which will form an important visual amenity and open space for surrounding residents, and a point to pause on the waterfront, opposite the gateway to the site via the new station.

Distribution of non-residential uses

5.3.4 LAND USES

Residential uses

Rochester Riverside has an estimated capacity of 1,400 dwellings. The quantum of units will be dependent on the exact mix of typologies and unit sizes. Across the area, approximately 50% of residential dwellings should be delivered as houses. More than 50% of housing units should be family units with 3 bedrooms and above. The Council's policy target is to seek at least 25% of homes to be affordable homes.

Proposals should distribute affordable housing across the site with the exact location and proportion to be agreed with Medway Council and in proportion with current planning policy. Residential accommodation should also adhere to the Council's current Housing Design Standards as well as current standards for disabled housing, housing for the old and retired and life-time homes.

Office space

Office accommodation could be accommodated in a number of locations along the railway corridor adjacent to the north-south spine, maximising accessibility to the new station and vehicular access by car. The indicative land use plan identifies a new office building opposite Castle View Business Park, taking advantage of co-location with existing and future activities, and also being close to Acorn Wharf and the proposed new park.

Retail

The masterplan includes a modest proportion of retail activities including café and restaurant uses in the following locations:

- **Station Gateway:** A small retail unit should be delivered adjacent to the station. It is envisaged that this would be a small foodstore, in accordance with adopted policies in relation to impact and sequential assessment.
- **Blue Boar Wharf:** The space by the historic crane should be a destination for food, drink and retail activities. This mix of uses will help to establish a complementary offer to the existing offer of the High Street.
- **Stanley Wharf:** A waterfront cafe presence is proposed, helping to establish a greater critical mass of amenity services adjacent to the existing health and retail units delivered as part of phase 1.

Mixed employment

The masterplan proposes a "mixed employment" approach for Acorn Wharf and Castle View Business Park. This reflects a desire to promote a flexible mix of commercial activities ranging from conventional business uses (B1) to retail activities (A1 to A4). Castle View Business Park will continue to have a similar employment character. Opportunities exist to deliver new employment floorspace at the entrance to the business park, forming a cluster of business activity with the adjacent office building at the southern end of Acorn Park.

Acorn Wharf could accommodate a range of uses including office space, workshops, studios and ancillary space for retail and cafés.

Hotel

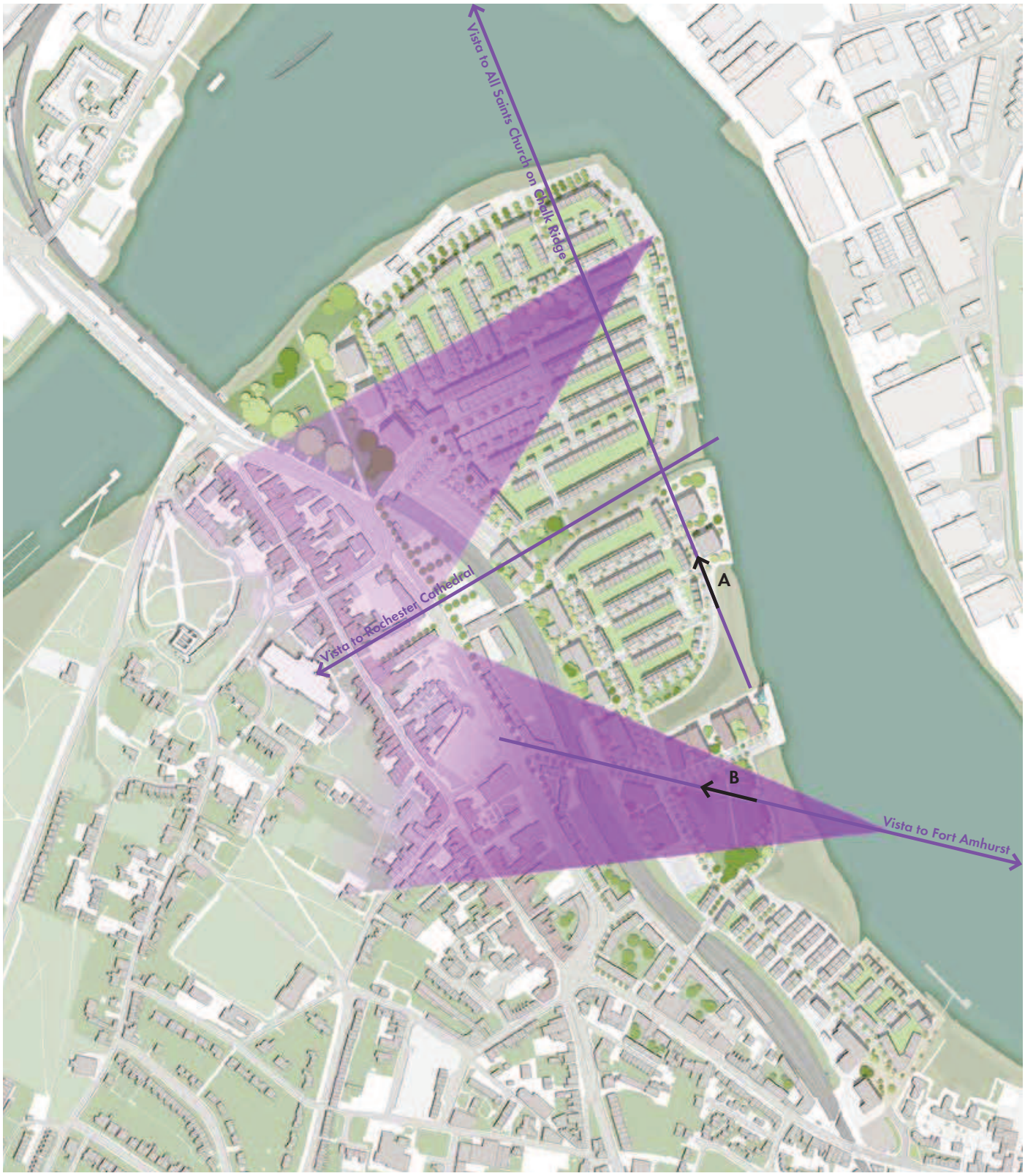
The preferred location for a hotel is adjacent to the retail uses in the station gateway area. Subject to longer term market conditions, an additional hotel could be delivered at Blue Boar Wharf in proximity to the waterfront retail uses. This site might also be appropriate for a small business centre.

Community uses and education

The masterplan includes a new two-form entry primary school and nursery with associated play area and publicly shared all weather pitch, youth facilities, community / multi-faith centre and health centre. The new primary school is centrally located within the site serving Rochester Riverside as a whole. Additional community facilities including health facilities should also be provided in line with existing policy requirements and be designed flexibly to accommodate a wide range of future uses, activities and users. Development proposals should also include off-site recreation and sports provision. An indicative location for a new community building has been defined adjacent to Blue Boar Lane, the primary school and Furrell's Park.

Non-residential hubs

1 Station Gateway
2 Castle View Business Park
3 Blue Boar Wharf
4 Acorn Wharf
5 Stanley Wharf



Key views and vistas

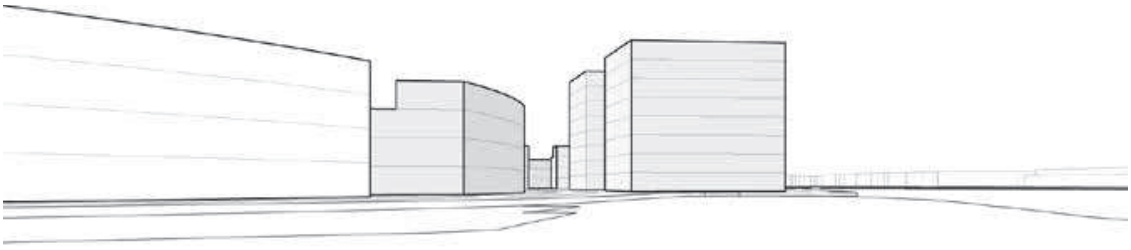
5.3.5 VIEWS AND VISTAS

Medway Waterfront has a distinctive character with a substantial amount of remaining historic townscape assets. The landscape and riverside setting gives rise to many distinctive views and vistas. The adjacent plan illustrates the key views and vistas which exist within and through the Rochester Riverside site. These views from corridors and vistas should be considered carefully through the development proposals.

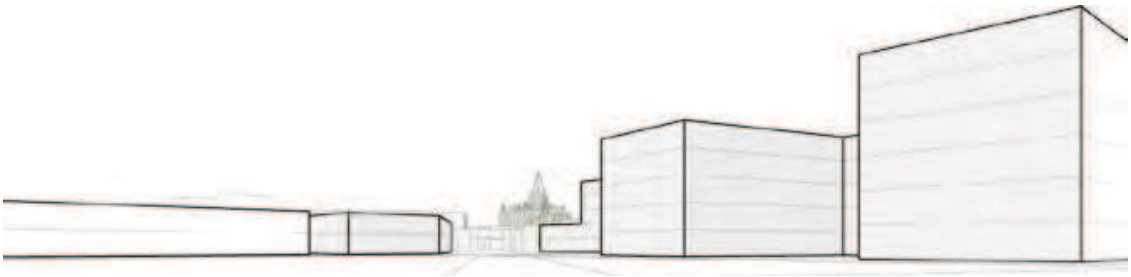
Detailed proposals for buildings of 5 storeys or above will need to be based on a comprehensive visual analysis of any proposals. Development should respond to the following principles:

- **Creating view corridors** – development proposals should create primary internal view corridors that are framed by the castle and cathedral, and view corridors of defining local elements (e.g. parks and landmark buildings).
- **Protecting important views** – any future development will be evaluated against impact on important views and vistas. The layout of the built form is to strengthen the visual importance of the cathedral and castle by creating view corridors.
- **Respond to existing markers and landmarks** – the detailed design and development of Rochester should respond appropriately to the existing landscape markers. Rochester Riverside should form a sensitive and attractive backdrop to views of the Cathedral and Castle.

The following images illustrate a selection of simple townscape views which coincide with key viewing corridors and vistas as defined on the plan.



View A - Vista to All Saints Church on Chalk Ridge



View B - Vista to Rochester Cathedral

5.3.6 HEIGHTS, SCALE AND MASSING

The adjacent plan provides guidance on the proposed building heights for Rochester Riverside. Heights range from 1 to 8 storeys, with the exact scale informed by a number of factors including viewing corridors, typology and enclosure of space.

More detailed scheme proposals would need to go further in showing appropriate modulation of building heights to create interest and variety.

Building heights

The model above provides a broad summary of the approximate height and massing of buildings at Rochester Riverside with existing buildings shown for context

flats
mansion blocks/semi-detached houses/large terraced houses
terraced house
mews house

Residential typologies

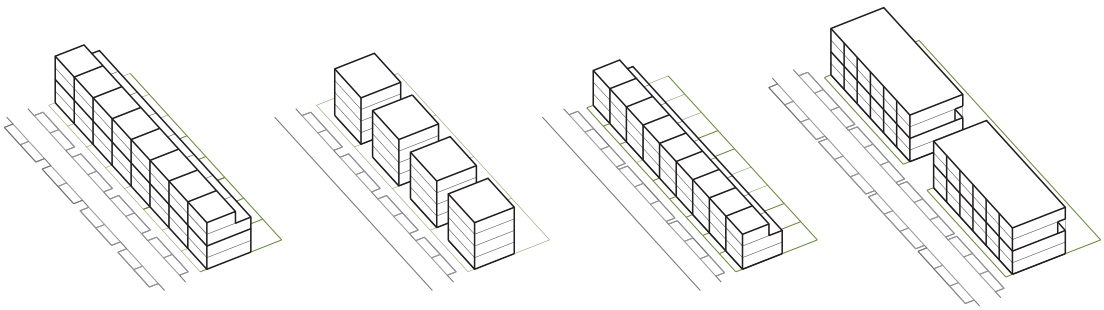
5.3.7 DEVELOPMENT FORM AND HOUSING TYPOLOGIES

The adjacent drawing summarises the indicative of housing typologies embedded in the illustrative masterplan. The drawing should be read in tandem with the heights, scale and massing plan and guidance in the previous section. Although the drawing should be interpreted with a degree of flexibility, the following principles form a central element of the Development Brief:

- Apartment blocks: Apartment blocks should be carefully located in specific locations. This is likely to be a dominant typology adjacent to the railway viaduct running north-south to the west of the proposed spine road. Specific opportunities also exist at points along the waterfront including Blue Board Wharf, the narrow site south of Cory Wharf and as part of a broader mix of low/mid-rise buildings at Stanley Wharf.
- 3 or 4 storey edges: A particular typology is the use of 3 or 4 storey buildings with greater presence along key edges to the site such as the spine road and the waterfront. The purpose of this approach is to create a sufficient degree of enclosure to key spaces, with an human scale and appropriately urban character. These residential buildings could be delivered in number of typologies including mansion blocks, large terraced houses, town houses or semi-detached housing. Mansion blocks could accommodate a range of different unit sizes and types, but the illustrative masterplan assumes that these are larger apartments.
- 2/3 storey terraced streets: Many of the local residential streets are laid out with conventional terraced dwellings, echoing the successful character of historic Rochester.
- Mews houses: A small proportion of the residential dwellings could be delivered in a contemporary mews format. This typology works particularly well in the narrower parts of the site, either as streets in their own right (see area north of Stanley Wharf) or as part of the mix across the urban block (see Stanley Wharf).

Section 5.3.9 provides specific guidance on the approach to parking for the different housing typologies identified above.

It is important to note that the proposed framework of streets and spaces has potential to accommodate a wide range of different scenarios in terms of the mix of different housing typologies.



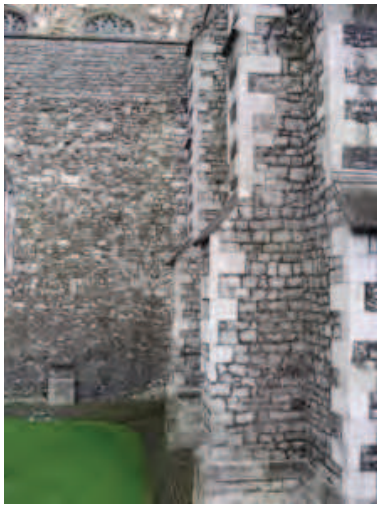
Potential variations in housing typology based on a single framework for the street

Brick

Brick - burnt headers

Brick - decorative

Combination of natural stone, decorative brick and slate roof tiles



Natural stone - rough

Natural stone - smooth

Weatherboard - white

Weatherboard - brown

Weatherboard - various

5.3.8 MATERIALS

The Development Brief provides a framework to manage and steer more detailed design work for subsequent phases of development. The materiality of buildings and key spaces is an important element in this, and will play an instrumental role in defining character and identity.

Local materials

Buildings should use local materials as far as possible with particular emphasis on brick for all buildings.

A range of colours and finishes should be employed including red, yellow and glazed brick. Varying brick types could be used to create patterns or highlight specific features within the facade.

Certain buildings might benefit from a specific, distinct treatment. For example, the mews buildings could employ a white glazed brick, in keeping with their traditional working yard character.

Other appropriate local materials could include the following:

- Weatherboard with a range of finishes including white, brown or black staining;
- Natural stones with both rough and smooth appearances; and
- Terracotta or slate tiles, or zinc / lead for roofs.

In terms of fenestration, timber and aluminium frames will be welcomed but PVC is not appropriate.

The Development Brief seeks to limit the use of render as this is not in keeping with the local vernacular. Although some forms of metal might be appropriate as set out above, excessive use of contemporary metals including aluminium will not be acceptable.

Variation in colour will be encouraged, although this should be across an understated, limited palette.

Public realm treatment around the cathedral

Public realm treatment on The High Street

Restrained material palette with colour providing variation

Public Realm

Proposals should make reference to the area of public realm adjacent to the cathedral which employs a light coloured, cobbled stone to create an attractive, warm character. This approach should be replicated in special public realm areas, with the use of common materials for the pavement and roadway. Varying modules should be used to differentiate between the pavement and roadways.

Mews streets could incorporate clay paving similar to Rochester High Street to create a distinct street environment.

Although standard black top surfaces should be avoided in areas with an emphasis on pedestrian movement, other roads including the link road will be tarmacked. Natural stone chips should be rolled into the tarmac to create a more attractive finish.

The materials and character should vary along the length of the waterfront, reflecting the shifting character, form and function of the area.

Trees

Detailed schemes should demonstrate careful consideration of tree species, including early engagement with the Council's Tree Officer.

Residential streets should be well-planted with large trees with small foliage. The use of blossoming trees to create seasonal variety and colour will be welcomed. In broad terms, the link road with larger trees to create a boulevard character.

Areas such as the parks should feature a greater diversity of trees to create a distinctive setting.

It is recommended that areas leading to the routes through the viaduct should be planted with common species (e.g. Lime) either side of the railway to mark the threshold between the historic city and Rochester Riverside.

Bay windows

Balcony elements form an integral part of facade design

Appropriate boundary treatment

Appropriate boundary treatment

Roof gardens

Diverse roofscapes

Roofscapes, balconies, bays and roof gardens

Proposals should seek to incorporate innovative forms of internal and external space which add value and maximise views of key spaces and the waterfront. Balconies should draw reference from wharf buildings through the use of industrial steel. The use of bay windows and roof terraces will create attractive, desirable spaces and varied residental streets which maximise views to the key spaces.

Proposals should seek to deliver a diverse roofscpae character through variations in height, materiality and detailing.

Boundary treatment

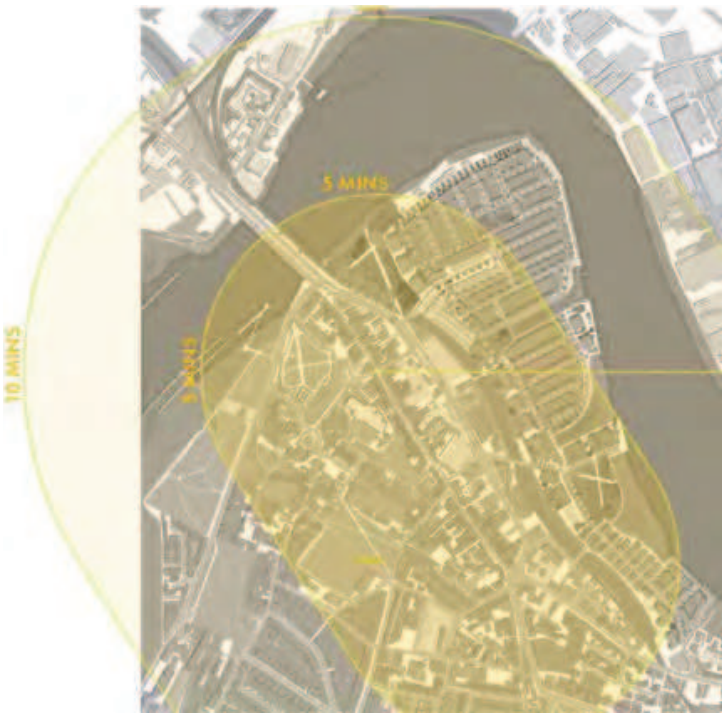
Proposals should demonstrate that boundary treatments have been considered as an integral part of the design process, and not an add-on at the end. Clear demarkcation of public and private space is required including consideration of bin storage, parking and the design of privacy strips.

5.3.9 PARKING

A standard for Rochester Riverside

- Rochester Riverside is immediately adjacent to the historic core of Rochester, one of Medway's primary urban areas.
- The site will benefit from a major new railway station, opening up access to London, the continent and other destinations in Kent. The site is also close to existing bus stops and routes which serve Rochester. The vast majority of the site is within 5 minutes walk of the station, and the whole area is well-within 10 minutes of the station.
- The masterplan proposes two local convenience hubs situated in the central and southern end of the site. The split provision means a very high proportion of the site is situated within 5 minutes walk of one of these clusters.

In that context, a specific standard has been established for Rochester Riverside which is set out on the following page.



Plan illustrating the indicative 5 minute and 10 minute walking distance from Rochester High Street

Indicative 5 minute and 10 minute walking distance from the local convenience hubs

Indicative 5 / 10 minute walking distance from the new station

A standard for Rochester Riverside

Following an extended process of feasibility and options appraisal including informal review by an all-member planning panel, the Rochester Riverside Board has indicated that the following standards would be appropriate for Rochester Riverside.

	Unit size	Proposed reduced parking standards Spaces per unit
HOUSING	Semi detached	2
	Large town house	2
	Terraces	1.5
	Mews	1
FLATS	Mansion blocks (flats)	1
	Flats	1
	Visitor	0.25

It is important to note the following:

- The categories in the parking standard table make reference to the housing typologies (and not just the number of bedrooms);
- The categories highlighted in yellow are those which entail a revision in the Council's overall standard;
- All units have a minimum of 1 space per unit + 0.25 visitor spaces;
- Houses have a minimum of 1.5 spaces per unit + 0.25 visitor spaces; and
- The Rochester Riverside standards envisage a small reduction in the Council's overall standard for flats and smaller housing units. These include mews housing which is likely to be a very small proportion of the housing mix and 2 bedroom terraces.

Based on an indicative development quantum of 1,400 units with an assumed mix of different residential typologies and house sizes, it is anticipated that the revised standard would result in an approximate 18% reduction in residential parking provision. Further flexibility such as a resident permit system for the Medway Council-owned long stay car park could also provide additional spaces at evenings and weekends. There is also future potential to create a multi-storey car park on the site of the long-stay car park if additional spaces are required now, or in the future.

Parking typologies

The adjacent plan illustrates the various approaches to parking provision. This should be read alongside section 5.3.7 which describes the approach to housing and development typologies accross the site. The following guidance should be noted:

- Undercroft and deck parking: flatted apartment blocks, office buildings and other commercial space will incorporate decked or undercroft parking solutions. It is important that elevations adjacent to important streets maintain an attractive / active frontage where possible. Some larger residential typologies such as townhouses and mansion blocks might also make use of undercroft parking. Ideally, upper floors should overlook first floor roof terraces to create a more attractive setting for dwellings.
- On street parking: the vast majority of streets make use of on-street parking. It is important that the provision of parking bays does not compromise the wider character of the street in terms of privacy zones, street trees and boundary treatment.
- On plot parking: All mews housing will require a on-plot parking space as an integral garage.

Parking types - indicative parking arrangements based on the illustrative mix of housing typologies and uses in the current masterplan

Rear garages might also be incorporated as part of semi-detached units on the waterfront where appropriate.

- Surface car parks: A long-stay car park and a replacement coach park will be delivered adjacent to Gas House Road and the new entrance to the site from the relocated station. The long stay car park has potential to expand as a multi-storey car park as additional spaces are required. It is important that these surface car parks are integrated with the wider site through a sensitive landscape scheme which maintains the quality of this important gateway location.

5.3.10 ENERGY EFFICIENCY AND RENEWABLE ENERGY

The Council will require detailed proposals to comply with Building Regulations and adopted policies and standards in relation to energy efficiency and renewable energy.

All new development will be expected to maximise energy efficiency savings through passive design and building fabric improvements. Development at Rochester Riverside should seek to meet 20% of the residual on-site energy requirements from decentralised, renewable energy sources.

5.3.11 TEMPORARY AND INTERIM USES

Temporary, interim or meanwhile uses have a key role to play in creating a coherent and integrated sense of place and neighbourhood during the phased process of development at Rochester Riverside. Temporary activities have the potential to enliven key buildings or sites during the construction phase of adjacent parts of the site, or prior to the commencement of permanent development for certain phases. There are three main strands to this:

1. Creative re-use of buildings and structures:

The buildings at Acorn Wharf have a distinctive character and there could be potential for short and medium term re-use of the Wharf buildings for creative activities such as studio or exhibition space and festivals. Over time, this type of activity could help to create a reputation for Acorn Wharf as a cultural or creative destination, nurturing a demand for permanent economic activities and enterprise space, either in the existing wharf buildings, or in new contemporary space with a similar scale and presence on the waterfront.

The various railway arches also have potential to occupy a similar function and use. The Council is already promoting a more permanent use of the southern arches which is a very positive step in nurturing a sense of dynamism around the Doust Square area.

2. Temporary use of vacant / later phase sites:

The phased approach to development will result in opportunties to establish temporary uses or structures in key parts of the site. One area which would benefit from a specific strategy of interim activities is the areas adjacent to the raiway viaduct in the vicinity of the long stay car park and replacement coach park.

Links should be forged with local creative sector organisations to facilitate temporary use of these locations, possibly as short-term installations or visitor attractions. The Union Street site near London's South Bank has been reinvented several times as part of the London Festival of Architecture. The site, which abuts a railway viaduct has been successfully re-programmed as an urban lido and an urban orchard, providing a popular location for local people and visitors.

3. Events strategy to enliven streets and spaces:

Rochester benefits from a number of regular events such as the Farmers Markets and Dickens Festival which are well-attended by residents and visitors. Medway Council should consider opportunities to integrate these events with Rochester Riverside site making good use of the new parks and open spaces delivered through the development.

Farmers market

Image caption

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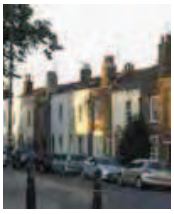
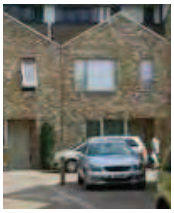
5.4 PLACE-MAKING

5.4.1 THE STREET





Types of street

The Rochester Riverside masterplan is defined by a network of streets, which are largely orientated east-west for maximum physical and visual connection to the water. The main types of streets included in the masterplan are described below.

Link road

Running parallel to the railway is Rochester Riverside's main linking road or boulevard. It is the widest continuous street in the masterplan characterised by larger scale trees, generally wider pavements and flatted developments along the railway corridor to the west. Many of the non-residential uses are located along this road, including the office block at Acorn Park, the new employment space at the entrance to Castle View Business Park, the hotel and retail unit at station square, the community building and school adjacent to Furrell's Park and the pharmacy and retail unit at Doust Square. The Railway Corridor is described in more detail in section 5.4.5.

Internal residential streets

The majority of streets in the masterplan are of this type. Resembling the successful form and character of existing neighbourhoods in Rochester, they should have a quiet, green character fronted by houses of 2 or 3 storeys. The road width should be at least 4.8m with on-street parallel parking either side interspersed with street trees. Pavements should be between 1.5 and 2m, with small front gardens providing a transition from public street to private dwelling.

Mews streets

The mews streets have no on-street parking as all mews houses have a garage incorporated at ground floor. The total street width from house to house is therefore much narrower creating a more intimate street environment. They feel more private than the other residential streets as the majority are not through roads and are relatively short in length. With street space shared between cars and pedestrians the Mews streets will be more like shared yards than formal streets.

Waterfront streets

The waterfront streets in the masterplan include all the streets fronting the creeks and the riverside streets of Limehouse Wharf and Stanley Wharf. Each of these streets forms part of the riverside walk and as such are shared surface to give pedestrian priority with informal parking along the water's edge. The Creeks are described in further detail in section 5.4.4.

open spaces
vehicular routes
riverside parade
shared surface
existing buildings

1 Acorn Park
2 Acorn Wharf Parade
3 Riverfront Mansions
4 Cory Creek
5 Cory Gardens
6 Blue Boar Wharf
7 Furrell's Park
8 Stanley Wharf
9 Doust Square

Riverside walk landscape plan

1

4

7

5.4.2 WATERFRONT

2

3

5

6

8

9

The waterfront at Rochester Riverside plays a key role in the masterplan providing new amenity space for residents of the development and the wider town. It is easily accessible, located only a few minutes walk from the town centre and the new railway station on Corporation Street.

Houses located along the water's edge are intended to be larger in scale and massing and views to the water are maintained through a network of permeable streets and a typical height of up to four storeys. A continuous, walkable edge of 1.6 miles runs between Doust Square and Acorn Park. Some of the route is wholly pedestrianised and other parts become shared surface. The route passes through a range of character areas including parkland, treed boulevards, commercial squares, quiet waterfront streets and semi-public residential squares. All internal streets are orientated towards the waterfront and many of the waterfront streets accommodate on street parking, creating a well-connected, active landscape.

It is intended that this varied waterfront will become a defining feature of Rochester Riverside.

Rochester

Hafencity, Hamburg

Veerhaven, Rotterdam

Types of open space

The masterplan broadly defines three types of open space: public parks, neighbourhood spaces and local places. Each space should accommodate a variety of activity and have its own specific character relating to its location and role within the neighbourhood.

Public parks

There are two public parks within the masterplan, both of which should take advantage of their waterfront location.

Acorn Park is situated at the north-west corner of Rochester Riverside and houses the Roman Wall. It is the more tranquil of the two parks and will be heavily treed with defined legible paths, similar to many of the parks found within Rochester town centre. Careful consideration must be given to the design of the apartment blocks along the eastern edge of the park to ensure the open space remains well connected.

Furrell's Park will be used as both a thoroughfare and for recreation due to its central location and its proximity to a range of public activities. It should feel more urban in character than Acorn Park, with smaller scale trees so as not to block views of the Medway. Its design should take into account the commercial offer of Blue Boar Wharf to the North, potential use by the adjacent school to the west and its relationship to the adjoining riverside walk to the east.

Neighbourhood spaces

A number of neighbourhood spaces have been identified. Their character tends to be focused around the waterfront. These include Acorn Wharf, the creeks and Blue Boar Wharf. Each of these areas is described in greater detail over the next few pages.

5.4.3 OPEN SPACES

Eldon Square, Reading

Nightingale Square, Clapham

Local spaces

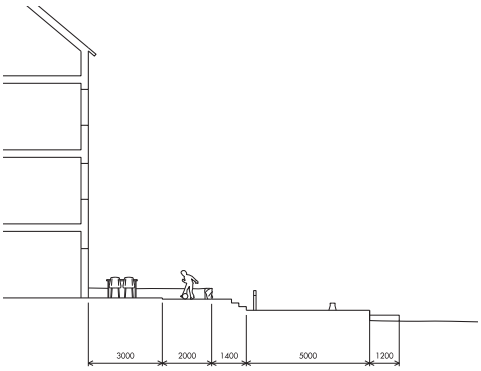
Local spaces are those that are most often used by residents in the immediate vicinity. Rochester Riverside's local spaces include Limehouse Gardens, the Square at Doust Way and Cory Gardens located at the end of Cory Creek.

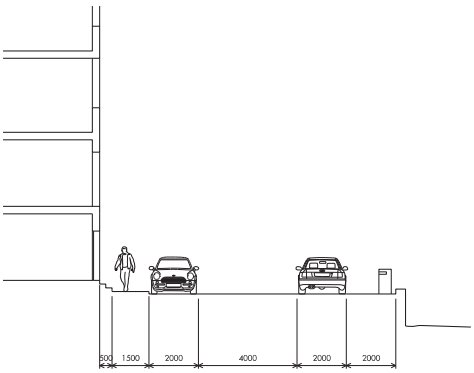
Both Cory Gardens and Limehouse Gardens are intended to follow the typology of a typical Victorian residential square. Larger scale houses front these spaces and they have the potential to accommodate growing spaces, play areas and communal seating for local residents. Both have parking along their edges to provide a threshold between the road and the gardens. Cory Gardens will feel more public as it located on the main thoroughfare and sits opposite the station square, where as Limehouese gardens will be more intimate and enclosed.

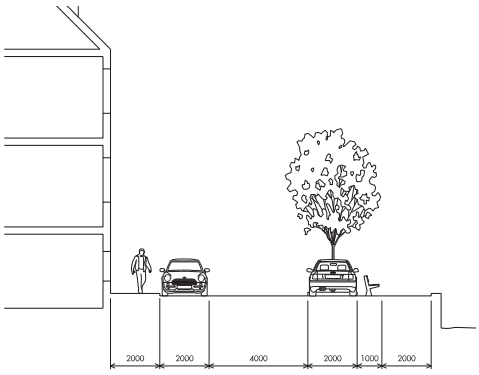
The square at Doust Way will be hard landscaped and laid out as a shared surface to give pedestrian priority. The residential buildings to the north-east of the square should be designed so as to provide an appropriate edge to this new public space, whilst ensuring units have suitable levels of privacy.

Artist's impression of Cory Creek

5.4.4 CREEKS







Example edge conditions

The creeks at Rochester Riverside are large, open areas that enable views and connections between different streets and the water and also back to historic Rochester. The streets that run along their edges form part of the Riverside Walk and are intended to be enjoyable amenity spaces where residents can walk, cycle, play and relax.

Cory Creek

Cory Creek is located opposite Station Square and it is your first impression of the water upon entering Rochester Riverside from the Station. Cory Gardens provides a small neighbourhood space at the entrance to the creek with clear views back to the Castle and Cathedral of Historic Rochester. Streets are shared surface with informal parking along the water's edge.

Blue Boar Creek

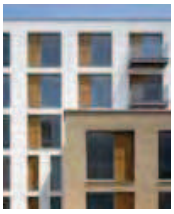
Blue Boar Creek forms the edge to a radial street, with larger houses fronting the water. To the North, two special apartment blocks are given private river frontage. Blue Boar Wharf to the south is intended to be an animated, hard landscaped space which is fronted by apartment blocks with commercial uses at ground floor.

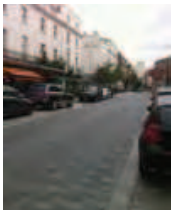
Furrell's Creek

Furrell's Creek is the most public of the Creeks with Furrell's Park and Blue Boar Wharf taking up a large part of its edge. From Furrell's Park there are clear views back to the Cathedral and Castle in the Town Centre. The short Mews Streets to the South are all orientated towards the water to enable each Mews house to enjoy the benefit of their waterside location.

Artist's impression looking towards the station square and hotel

5.4.5 RAILWAY CORRIDOR





Street environment

The railway corridor includes the main link road through Rochester Riverside. It is orientated north-south with three points of vehicular access from the other side of the railway; these are at the edge of Acorn Park, by the proposed location of the school and at Doust Square. There are further pedestrian only crossings at the new station and from the A2 Rochester bridge down into Acorn Park. The link road is intended to be a treed boulevard, wider than the internal streets of the masterplan, with a continuous road width of 6m. The pavements are also more generous to accommodate increased foot fall and larger trees. Particular attention should be paid to the design of the ground floor condition of the large town houses and mansion blocks that front the eastern edge of the road to ensure adequate levels of privacy are achieved. The link road is able to accommodate a high proportion of perpendicular on-street parking.

Residential typologies

The majority of flatted development in the masterplan is located between the main spine road and the railway, with building heights determined by protected views and vistas and undercroft parking potential. Most residential blocks have undercroft parking facing the railway with maximum usable edge to prevent dead frontages. The three most northerly blocks have a special location facing onto Acorn Park.

The Station Square

A station square is proposed at the gateway to the new station. This will be where the hotel is located with potential for commercial at ground floor. On the opposite side of the square there will be small retail space, likely to be a foodstore and other convenience retail.

Railway corridor plan

View 1 - Artist's impression of Doust Square

5.4.6 STANLEY WHARF

As the first phase of the masterplan to be delivered, it is particularly important that the place-making aspirations of Stanley Wharf are implemented well to set a precedent for the rest of the masterplan area.

Doust Square

Doust Square was established through the original phase of development and should provide a strong point of arrival to Stanley Wharf. An existing pharmacy and shop front onto the square on its western edge and new 4 and 5 storey residential blocks will face onto the square from the east. These dwellings should be designed appropriately to have adequate levels of privacy at ground floor while providing a strong edge to the square, completing the enclosure of the space. Vistas towards the Riverside should be enhanced.

View 2 - Artist's impression of Stanley Wharf waterfront

St Andrew's, Bromley-by-Bow

Terraces, Barking Riverside

Maidstone Road, Rochester

Brighton College

View 3 - Artist's impression of mews street

Watts Avenue, Rochester

Mews Houses, Barking

The Riverside

Higher buildings are located along the waterfront with potential for a special tall building at its eastern end. In front of the tall building there is opportunity for a secondary public space to exist overlooking the Medway. The waterfront street should be generous in width and have a shared surface, giving cyclists and pedestrians priority. Informal parking will be located along its edge. The street forms part of the riverside walk and should be seen as an amenity space for residents to walk, cycle, play and relax.

Residential Streets

All interior residential streets are orientated towards the riverside enabling maximum physical and visual connections to the water. These streets will have a domestic scale with heights reduced to 2 and 3 storeys and a variety of housing typologies.

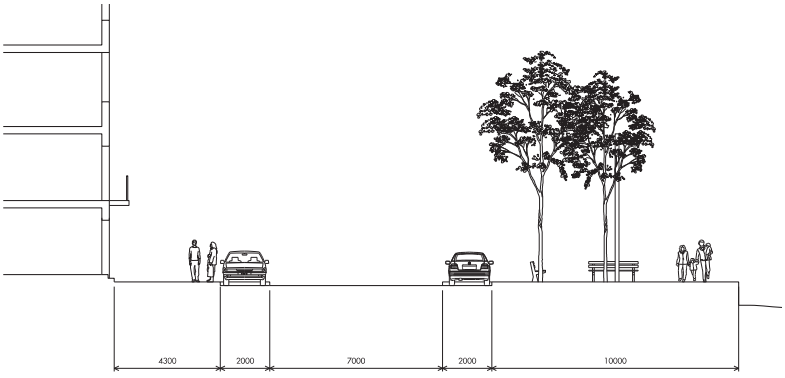
Streets and spaces should echo the successful form and character of existing neighbourhoods in Rochester but with architectural form and detailing more contemporary in character. Material choice should draw on the traditional local context.

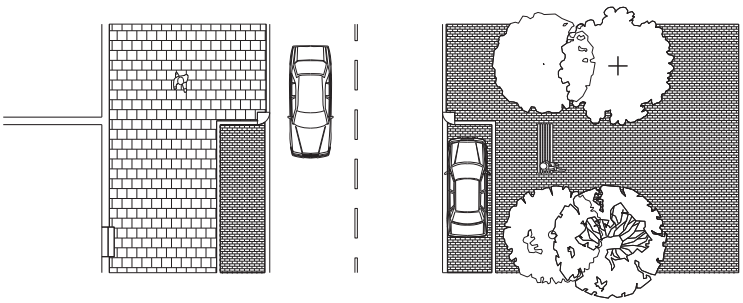
Artist's impression of Acorn Wharf streetscape

5.4.7 ACORN WHARF

Existing wharf buildings

Waterfront parade





Suggestive landscape drawings of Acorn Wharf streetscape

Commercial Buildings

Acorn Wharf is one of the commercial hubs at Rochester Riverside. It is envisaged that a flexible mix of commercial activities will be promoted here, including office space, workshops, studios and the potential for a small amount of retail and cafes. The character of Acorn Wharf should take precedent from Rochester Riverside's industrial heritage and as such it is anticipated that the existing Shipyard buildings will be reused and renovated.

Acorn Wharf Parade

A wide, tree lined parade stretches the length of Acorn Wharf, forming the beginning of the riverside walk. It should be a hard-landscaped space that is able to accommodate a range of uses including public events, seating, cyclists and pedestrians and outdoor terraces for the commercial units. The parade also serves as a transitional space from residential street to commercial hub. On-street parking on both sides of the street provides the additional spaces required by the large townhouses and mansion blocks and a number of additional spaces are allocated for commercial use alongside the Shipyard Buildings.

Artist's impression of Blue Boar Wharf

5.4.8 BLUE BOAR WHARF

Existing Blue Boar Wharf

Blue Boar Wharf is a hard-landscaped public space overlooking the Medway. It forms part of one of Rochester Riverside's commercial hubs and is intended to be a destination for food, drink and retail activities.

In keeping with the industrial heritage of the Riverside, the historic crane should be kept as a focal point in the space and there should be provision for seating, cyclists, pedestrians and outdoor terraces for the commercial units. It is intended to have a much more commercial focus that other public spaces within the masterplan.

Castle View Option 1

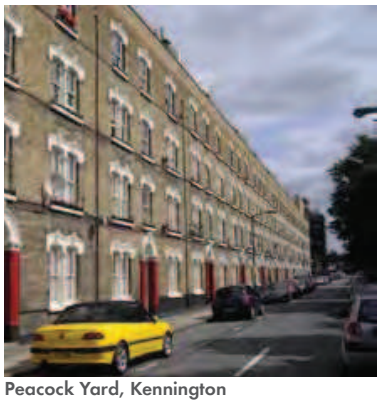
Castle View Option 2

5.4.9 CASTLE VIEW BUSINESS PARK

Existing Castle View business park

Iliffe Yard, Kennington

Iliffe Yard, Kennington



Peacock Yard, Kennington

Castle View today

Castle View Business Park currently sits outside the masterplan area and as such it is likely to maintain a similar character to what exists there presently. However, additional employment floorspace is proposed at the entrance to the business park, forming a cluster of business activity with the adjacent office building at the southern end of Acorn Park. There is also potential to re-landscape the interior street of the business park to make it more keeping with the rest of the masterplan area.

The spaces adjacent to the Castle View Business Park should be designed to enable any future redevelopment of the site to be implemented with ease.

Castle View in the future

Should the site be redeveloped a suitable precedent is the Pullens Estate in Kennington, consisting of Pullens Yard, Iliffe Yard, Peacock Yard and Clements Yard (see images to the left). These are a series of tenement blocks with working yard interiors. Formal flats and houses are located at the perimeter with office and workshop units on the interior and small commercial units at entrances to the yards. This domestic type of mixed employment space would be an appropriate typology for the residential neighbourhood in which Castle View Business Park sits. In addition, with many more people freelance or working from home individual work units in a communal setting could be a popular proposition for Rochester Riverside.

CHAPTER 6:
DELIVERY AND IMPLEMENTATION

Phasing plan illustrating the indicative sequence of development

6.1 DELIVERY

Background

Delivery of development at Rochester Riverside is being led by Medway Council, strongly supported by its partner, the Homes and Communities Agency (HCA). Strategic direction and decisions are provided by the Rochester Riverside Board which is chaired by the Leader of Medway Council and made up of Medway Council member and officers and HCA representatives.

The implementation of development at Rochester Riverside has already been underway for some years. Over £90 million of funding has been invested in site assembly, land raising, flood defence and river wall installation and site remediation. A new riverside walk and cycleway opened in 2008.

The new access to the site at Doust Way has been created and the first phase of development comprising affordable and extra care homes, retail units, car parking and a landscaped square was completed in 2013.

Construction of the new £26 million Rochester station has commenced and is due to completed by December 2015. The commencement of the next phase of development, Stanley Wharf, has started with the tendering for a development partner.

Further investment in the site will take place with the construction by the Council of the link road between Doust Way and Gas House Road which will provide the primary north-south route through the site alongside the development of a long-stay car park close to the station and a replacement coach parking area.

Role of the Masterplan and Development Brief

A principal purpose of this new Masterplan and Development Brief for Rochester Riverside has been to provide a review and update from the 2004 Development Brief and 2006 Masterplan which reflects works carried out to the site, current planning policies and design standards and the economic and market context.

The masterplan is based on five main design principles. Key amongst these is flexibility and deliverability. The masterplan incorporates a flexible approach which allows a range of different housing typologies to come forward over the lifetime of the development, within an overall framework of streets and spaces. This approach prioritises deliverability and allows the development to respond to changing patterns of demand over time. Additionally, the masterplan has been informed by a robust understanding of market dynamics and trends.

Land Ownership

Over many years, Medway Council and the HCA have pursued a process of land acquisition and have assembled almost the entire Rochester Riverside site in their ownership. Castle View Business Park and Acorn Shipyard currently remain in private ownership but do not provide any constraint on development.

Delivery Approach

As landowners and significant investors in the Rochester Riverside site, Medway Council and the HCA will continue to lead the delivery of development. These partners will seek to ensure the aims of this brief are delivered and that the public sector receives a return on the significant investment which has been made in the site. It is expected that the continued implementation of development will be undertaken in partnership

with private sector development partners. In common with the flexibility shown by the new masterplan, there is flexibility in the delivery structures which may be used. The options may include the following;

- direct development by the Council and/or HCA;
- joint venture development with private sector partners;
- land sale to private sector partners.

As development progresses, the partners will continually review the most suitable delivery structure to be used according to the circumstances. Whichever delivery structure is being used, the partners will expect to use their position and influence as landowner to control the implementation of development and ensure that the development which is actually delivered meets the design and quality standards set out in this brief. Measures will include landowner approval of planning applications and permitted drawdown of land only on successful completion of earlier phases.

Phasing

Consideration has been given to development phasing and an indicative phasing plan is shown. The phasing plan reflects the potential for delivery of development to utilise the two main vehicular access points at Gas House Road and Doust Way allowing development phases to come forward in parallel.

It is expected that the next phase of development after Stanley Wharf (Phase 1) will involve a substantial development around the new station (phase 2) followed by the land immediately to the north of Stanley Wharf (phase 3). Subsequent phases of development are envisaged to expand outwards from this central node.

However, the phasing plan shown is illustrative only and may be subject to change as development progresses. Further phasing detail will be required to be provided in individual planning applications.

It is envisaged that, given the significant scale of development, overall implementation will take 15 – 20 years and it is acknowledged that the rate of delivery of development will be influenced to a large extent by the prevailing market conditions

Planning Obligations

Developer contributions are currently based on the Medway Council Developer Contributions Guide (November 2012) which is an adopted SPD but is currently being reviewed and updated. It should be noted that as a unitary authority Medway Council is responsible for the full range of local government services including education and social services. The SPD covers:

- Affordable housing
- Open space
- Environmental mitigation
- Children's services (schools)
- Community development
- Transport and travel
- Training and workforce development
- Adult services social care
- Health
- Waste and recycling

Technical guidance for individual service areas is provided in the SPD, including individual contributions and how these are calculated (including formulae).

In relation to affordable housing, the Council's policy target is to seek at least 25% of homes to be affordable homes.

Management Company

It is the intention of the Council and HCA to set up a Management Company for Rochester Riverside to manage and maintain the non-adoptable public areas of the site, including the River Walk and any green spaces and minor access roads. The Management Company will likely take the form of a Community Interest Company (CIC). Residents will be required to pay a service charge to the Management Company to cover the costs of management and maintenance of these areas.

The River Wall will remain in the ownership and maintenance responsibility of Medway Council.

Planning applications

In the absence of a fixed delivery structure, a flexibile approach to planning applications is encouraged. Depending on market conditions and the size of indvidual phases, small detailed applications could be progressed (such as Stanley Wharf). Larger phases might entail outline applications or hybrid applications (i.e. part-detailed, part-outline) with sub-phases dealt with as reserved matters applications.

Applications are likely to be made by selected private sector development partners but some phases or uses might be submitted for planning permission by the Council or HCA.

Design quality

Chapter 5 identifies a flexible framework of guidance and principles which sets a robust context for more detailed schemes to be delivered.

The Council proposes to retain the masterplanning team to monitor the quality of emerging proposals to maintain a high standard of design, and to ensure that proposals are consistent with the overall vision for Rochester Riverside.

As part of this process, the Council might seek to prepare more detailed design guidance or coding for key phases of the development.

Schemes for indvidual phases will be required to attend Design Review at an early point in the design process.

CHAPTER 7:
NEXT STEPS

The draft SPD will be subject to a 6 week period of consultation starting on 28 April 2014 and ending on 6 June 2014.

7.1 NEXT STEPS

Consultation

The Rochester Riverside Development Brief will be subject to a 6-week period of consultation in line with the adopted Medway Council Statement of Community Involvement.

This will commence on 28 April 2014 and finish on 6 June 2014.

Following a detailed review of comments and responses, the Council will agree changes to the report and update the guidance accordingly.

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Agenda Item 6.

Medway Council
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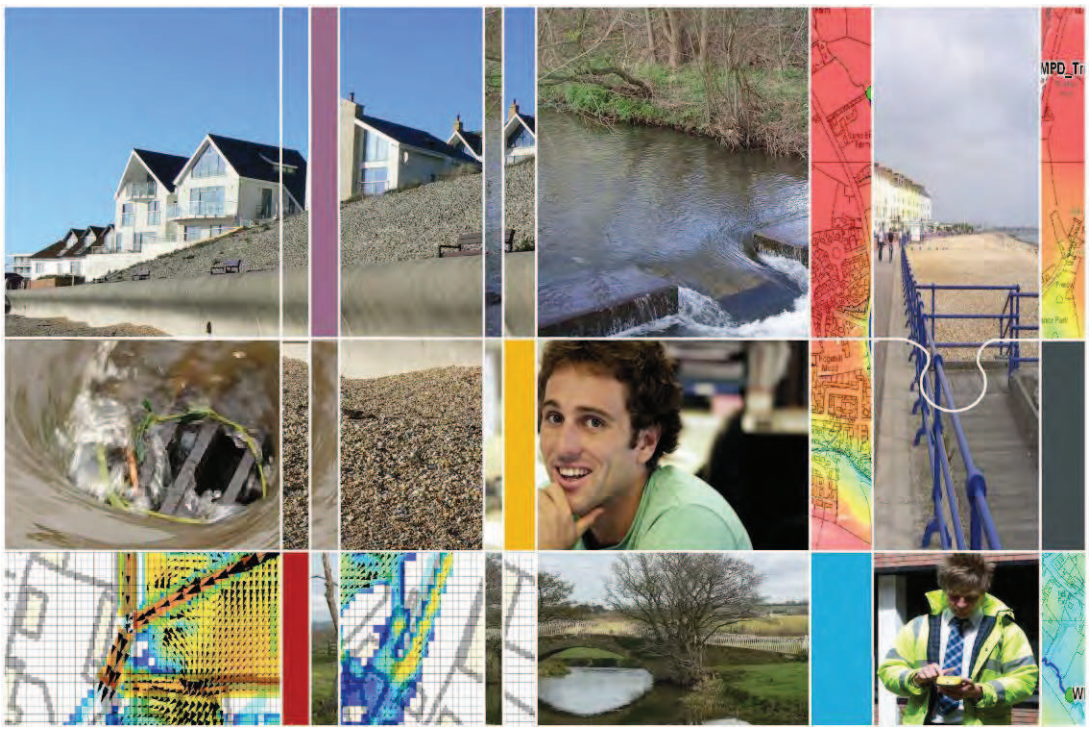
Commission reference: LA020



Medway Council Local Flood Risk Management Strategy

Draft Report

January 2014

CAPITA SYMONDS | URS
Flood Risk Management

Document overview

Capita Symonds with URS Infrastructure and Environment UK Ltd was commissioned by Medway Council in the preparation of their Local Flood Risk Management Strategy as required under the Flood and Water Management Act 2010.

Document history

Version	Status	Issue date	Prepared by	Reviewed by	Approved by
1	Draft	Aug 2012	Sarah Littlewood Assistant Consultant Stephen Riley Principal Consultant	Stephen Riley Principal Consultant Jon Robinson Technical Director	Jon Robinson Technical Director Scott Ferguson Technical Director
2	Draft	July 2013	Emily Craven Principal Consultant	Stephen Riley Principal Consultant	
3	Draft	December 2013	Edward Byers Assistant Consultant	Emily Craven Principal Consultant	Jon Robinson Technical Director

Notice

Capita Symonds has produced this document with URS Infrastructure and Environment UK Ltd for Medway Council via the Strategic Flood Risk Management Framework.

Any liability arising out of use by a third party of this document for purposes not wholly connected with the above shall be the responsibility of that party who shall indemnify Capita Symonds and URS Ltd against all claims, costs, damages and losses arising out of such use.

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Foreword

This is Medway's first Local Flood Risk Management Strategy. Local flood risk is associated with flooding caused by surface runoff, groundwater and small watercourses, known as 'ordinary watercourses' (ditches and streams).

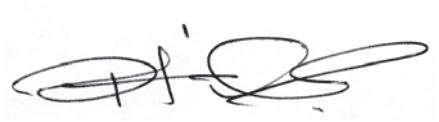
Flooding has a devastating impact on people and communities. Surface water flooding in particular was one of the major causes of widespread flooding experienced across England in 2007 as well as contributing more recently to the devastating impacts of flooding during 2013/2014.

We know that some of our areas are at risk to local flooding and do suffer from flooding from time to time. The likelihood of similar events to those flood events witnessed across England in 2007 and more recently is set to increase because of more extreme weather. This also means that some areas are at risk of flooding which may have never flooded previously are now considered to be at risk.

The Governments response to flooding experienced in 2007 resulted in a wide-ranging review of flood risk management policy published in the Pitt Review. The review resulted in legislation that required all County and Unitary Authorities to take on a role as a 'Lead Local Flood Authority'. Part of that role is to produce a strategy to ensure local flood risk is managed in a more coordinated way, enabling organisations to work better with each other and the public.

Assessing the risk from flooding can be a difficult task and that is the main focus of this strategy, to set a framework around what needs to be done to understand and manage flood risk in Medway.

We're keen to hear your views and receive any further information you may have on flood risk in your area.



Councillor Phil Filmer
Portfolio Holder, Front Line Services.

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Executive Summary

This Local Flood Risk Management Strategy 'the strategy' is a statutory document required by County and Unitary authorities under the Flood and Water Management Act 2010 (FWMA 2010).

Medway Council as a Lead Local Flood Authority are responsible for local flood risk management (defined by the FWMA 2010 as flood risk associated with surface water, ground water and ditches/streams). The Environment Agency (EA) remains the responsible authority for the management of tidal and river flood risk (from main rivers) and has produced a National Flood and Coastal Erosion Risk Management Strategy, which outlines their approach to manage those risks.

Although this strategy focuses on local flood risk, we are keen to make sure that all forms of flooding are considered and managed together according to the level of risk by working in partnership with the relevant authority.

The content under the following headings summarises the detail from each of the sections listed within the main report.

Section 1: Introduction

This section outlines why a strategy is required, who it is aimed at, and summarises the aim and objectives of the strategy.

Section 2: Legislation and policy

Provides a summary of the legislation and national and local policies relevant to the strategy. This includes an overview of previously completed studies and strategies and plans relevant to all forms of flood risk in Medway.

Section 3: Overview of flooding in Medway

This section provides an overview of local flood risk within Medway including historical flooding records.

Section 4: Managing flood risk in Medway

Authorities, organisations and individuals with responsibility for, and interest in, the management of local flood risk are identified in this section. It includes specific reference to the Risk Management Authorities (RMA's) defined in the FWMA 2010 and provides clarity on their roles and responsibilities.

The key RMA's within the Medway area are:

- Medway Council (Lead Local Flood Authority).
- Environment Agency.
- Highways Authority (within Medway Council).
- Lower Medway Internal Drainage Board.
- Southern Water.

Section 5: Flood Risk Management objectives

This section summarises the derivation of our local flood risk management objectives. The objectives defined are listed below, and have been developed to be consistent with the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy.

Medway Council will:

1. Work with internal and external stakeholders to develop a collective understanding of local flood risk to enable successful local flood risk management;
2. Monitor flood risk;
3. Ensure local policy is consistent with wider flood risk management policies and legislation at a national and regional level and provide clear advice on how to satisfy those policies within Medway;
4. Promote the use of Sustainable Drainage Systems (SuDs) in accordance with its forthcoming role as SuDS Advisory Body and the forthcoming National Standards;
5. Take account of the cumulative effect of development and climate change on the risk of flooding throughout Medway;
6. Ensure that all development has a positive or nil effect on the risk of flooding to and arising from proposed development;
7. Use flood risk information to implement a risk based approach to capital investment decisions and maintenance programmes and activities;
8. Give consideration to the economic, social and environmental benefits and limitations of flood risk management measures when making investment decisions;
9. Consider how future infrastructure improvements (e.g. highways/rail/public realm works) and/or changes could be used to deliver flood risk/surface water management benefits;
10. Share information with respect to flood risk across Medway with all Risk Management Authorities and the public;
11. Increase public awareness (property owners, developers) with respect to flood risk and responsibility for flood risk management;

12. Use information on flood risk as a tool for flood prediction and warning;
13. Ensure that emergency plans and responses to flood incidents in Medway are effective;
14. Ensure that communities understand the risks and their role and the role of Medway Council during an emergency.

Section 6: Measures for managing flood risk

This section outlines the approach to identify specific measures to achieve the objectives listed above. Due to the lack of good quality datasets, the strategy has focused on non-structural measures to enable the creation of a robust evidence base to identify critical drainage areas and significant flood risk areas. This information will then be used to inform structural options / measures and to prioritise flood risk management in the future.

The section also outlines the delivery of the measures including what departments within the council have responsibility for implementation and the timeframe by which the measures are expected to be carried out.

Section 7: Funding options

A summary of available sources of funding is provided in section 7 to help identify any further actions that will be needed to ensure that particular funding options are available. An overview of the following funding sources is provided: Area based grants, public funding from Flood Defence Grant in Aid, Community Infrastructure Levy, private funding through Section 106 agreements, local fundraising and other sources.

Section 8: Wider environmental objectives

Section 8 presents an assessment undertaken to consider how the strategy contributes to the achievement of Medway Council's wider environmental objectives. This has included a review of the environmental objectives contained within policy documents specific to the area.

The section also appraises the need for a Strategic Environmental Assessment (SEA) under the European Directive 2001/42/EC and associated Environmental Assessment of Plans and Programmes Regulations 2004.

Section 9: Review and update

This section considers the requirement to review and update the strategy and appraises the internal council procedures for review and the timeframes considered appropriate for update of the objectives and measures contained within the strategy.

Next Steps

Following consultation with the public and other risk management authorities, annual action plans will be produced in order to measure progress and inform further actions and investment decisions.

1. Introduction

1.1 Why has a Strategy been produced?

1.1.1 In 2008, Sir Michael Pitt published a report entitled 'Learning Lessons from the 2007 Floods'[1]. This report outlined the need for changes in the way the UK is adapting to the increased risk of flooding.

1.1.2 The Flood and Water Management Act[2] (FWMA), which gained Royal Assent in 2010, is an important part of the Government's response to Sir Michael Pitt's report. Through the FWMA, local authorities have a duty to take the lead in the management of local flood risk. Medway Council, as a designated Lead Local Flood Authority (LLFA), must 'develop, maintain and apply a Local Flood Risk Management Strategy' which will clarify who is responsible for local flood risk management and enable effective partnerships to be formed between relevant Risk Management Authorities.

1.1.3 The strategy will address local flood risk, which is defined as the risk of flooding from surface water runoff, groundwater and ordinary watercourses[3].

1.1.4 It is not possible to prevent all flooding; however, over time, Medway Council will use the strategy to increase the level of understanding of local flood risk posed to the community and to take the lead in effectively implementing measures to manage the risk where appropriate.

1.1.5 This document establishes the starting point for a long-term strategy to manage flood risk, which will influence future capital investment, maintenance, public engagement and understanding, land-use planning, emergency planning and future developments across Medway.

1.2 Who is the strategy aimed at?

1.2.1 The strategy is primarily intended as a document for use by Medway Council to assist them in the management of flood risk within their administrative area.

1.2.2 The document should also be of interest to RMA's (identified in Section 4) as well as individuals, communities, businesses and the general public who have an interest in the management of flood risk within the Medway Council administrative area.

[1] Cabinet Office (2008) Pitt Review – Learning Lessons from the 2007 Floods
[2] HMSO and the Queen's Printer of Acts of Parliament (2010) Flood and Water Management Act
[3] Strategies for the management of flood risk from main rivers and tidal flooding are managed by the Environment Agency (EA) communicated in their National Strategy, Catchment Flood Management Plans (CFMP) and Shoreline Management Plans (SMP).

1.2.3 An Executive Summary of this document is included that sets out the main aspects of the strategy.

1.3 Aim

1.3.1 The aim of the strategy is to outline the approach Medway Council, as LLFA will take to local flood risk management and record how this approach has been developed and agreed.

1.4 Objectives

1.4.1 In order to achieve the above aim, Part 1, Article 2, Section 9 Sub-section 1 of the FWMA states that: a Lead Local Flood Authority for an area in England must develop, maintain, apply and monitor a strategy for local flood risk management in its area (a Local Flood Risk Management Strategy). Part 1, Article 2, Section 9 Sub-section 1 of the FWMA states that the strategy must specify:

a) the RMAs in the authority's area.
b) the flood and coastal erosion risk management functions that may be exercised by those authorities in relation to the area.
c) the objectives for managing local flood risk (the strategy will inform objectives to be included in the authority's flood risk management plan which is required in accordance with the Flood Risk Regulations 2009).
d) the measures proposed to achieve those objectives.
e) how and when the measures are expected to be implemented.
f) the costs and benefits of those measures, and how they are to be paid for.
g) the assessment of local flood risk for the purpose of the strategy, (local flood risk is defined by the FWMA as flood risk from:
    - surface water
    - ground water and
    - ordinary watercourses
h) how and when the strategy is to be reviewed, and
i) how the strategy contributes to the achievement of wider environmental objectives.

2. Legislation and policy

2.1 Overview

2.1.1 This section provides a brief overview of the key legislative and national policy relevant to flood risk management in England, and a summary of local policy and existing flood risk studies and plans relevant to Medway.

2.2 Legislation

Flood and Water Management Act (2010)

2.2.1 The FWMA presents a number of challenges for policy makers and flood and coastal Risk Management Authorities to co-ordinate and deliver local flood risk management. It reinforces the need to manage flooding holistically and in a sustainable manner. This has grown from the key principles within Making Space for Water[4] and was further reinforced by the Pitt Review following the summer 2007 floods.

2.2.2 The FWMA implements several key recommendations of Sir Michael Pitt's Review of the summer 2007 floods, whilst also protecting water supplies to consumers and protecting community groups from excessive charges for surface water drainage.

2.2.3 Further information regarding the duties and powers Medway Council have as a LLFA under the FWMA is included within Section 4.

Flood Risk Regulations (2009)

2.2.4 The FWMA must also be considered in the context of the EU Floods Directive 2007/60/EC, which was transposed into UK law by the Flood Risk Regulations 2009 (the Regulations) on 10 December 2009. The Regulations require LLFAs to undertake three types of assessment/plan.

- Preliminary Flood Risk Assessment (PFRA): A report detailing information on past and future (potential) floods, and the identification of Flood Risk Areas. LLFAs are only required to undertake a PFRA for local sources of flooding. It is the responsibility of the Environment Agency to assess the flood risk from Main Rivers, the sea and reservoirs. Medway Council completed their PFRA[5] report and spreadsheets in accordance with the 22nd December 2011 deadline stipulated by the Regulations.

[4] Defra (February 2005) Making Space for Water
[5] Medway Council (2011) Preliminary Flood Risk Assessment Report

- Flood Hazard Maps and Flood Risk Maps: Following the identification of Flood Risk Areas, the EA and LLFAs are required to produce Hazard and Risk maps for sea, Main River and reservoir flooding as well as 'other' relevant sources by 22nd December 2013.
- Flood Risk Management Plans: The EA and LLFAs are required to produce Flood Risk Management Plans for sea, Main River and reservoir flooding as well as 'other' relevant sources by 22 December 2015.

2.2.5 The following legislation is also relevant to local flood risk management:

- The Highways Act 1980: An Act dealing with the management and operation of the road network in England and Wales including the drainage of highways.
- The Wildlife and Countryside Act 1981: This Act includes powers for the purposes of preventing serious damage to inland waters.
- The Building Act 1984: (also the Sustainable and Secure Buildings Act 2004 and Climate Change and Sustainable Energy Act 2006). Includes Building Regulations covering drainage of buildings and guidance for preventing the undue consumption, misuse or contamination of water.
- Environmental Protection Act 1990: Restrictions relating to the pollution of controlled waters.
- Town and Country Planning Act 1990: Regulation of development in England and Wales. Flood risk, policies are included with the National Planning Policy Framework (NPPF).
- Land Drainage Act 1991: An Act to consolidate the enactments relating to Internal Drainage Boards, and to the functions of such boards and of Local Authorities in relation to land drainage.
- Water Resources Act 1991: Regulates water resources, water quality and flood defence.
- Environment Act 1995: An Act, which led to the formation of the Environment Agency and sets out standards for environmental management.
- The Water Act 2003: Provided changes to legislation included in the Water Resources Act 1991 in relation to the abstraction and impounding of water.
- Civil Contingencies Act 2004: Establishes a framework for Emergency Planning.
- Climate Change Act 2008: Established a Committee on Climate Change and made provisions about adaptation to climate change.
- Localism Act 2011: Included the abolition of regional strategies and a duty to co-operate to planning of sustainable development.

- EU SEA Directive (2001/42/EC): This is mandatory for plans/programmes which are prepared for water management to determine whether the plans / programmes are likely to have a significant environmental effect.
- EU Habitats Directive (1992/43/EEC): Outlines Europe's nature conservation policy and requires measures to be taken to maintain or restore natural habitats taking account of economic, social and cultural requirements.
- The Local Democracy, Economic Development and Construction Act 2009: Promotes public involvement in relation to local authorities.

2.3 National policy, plans and strategies

National Planning Policy Framework (2012)

2.3.1 The National Planning Policy Framework[6] (NPPF) sets out the Government's planning policies for England and how these are expected to be applied. Section 10 of the NPPF sets out the approach for meeting the challenge of climate change, flooding and coastal change and highlights the role that Local Planning Authorities such as the have to ensure that inappropriate development in areas at risk of flooding is avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere.

2.3.2 The NPPF replaces Planning Policy Statement 25: Development and Flood Risk[7] (PPS25). The principles of PPS25 still form part of the new NPPF. The NPPF is supplemented by a Technical Guide, which elaborates on how the policies of the NPPF should be applied. At the time of issue of this strategy, the PPS25 Practice Guide[8] had not been revoked.

[6] CLG (March 2012) National Planning Policy Framework
[7] CLG (December 2006, revised March 2010) Planning Policy Statement 25: Development and Flood Risk
[8] CLG (December 2009) Planning Policy Statement 25: Development and Flood Risk Practice Guide

National Flood and Coastal Erosion Risk Management Strategy for England (2011)

2.3.3 The FWMA states that the EA must 'develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management in England' as part of its strategic overview role for flood and coastal erosion risk management. In response to this, the EA has developed the National Strategy jointly with DEFRA to ensure that it reflects government policy.

2.3.4 The National Strategy[9] was published in 2011 and sets out strategic aims and objectives for managing flood and coastal erosion risks and the measures proposed to achieve them. As required by the FWMA, Medway Council has sought to ensure that the strategy is consistent with the approach and guiding principles that have been set out in the National Strategy.

2.4 Local policy, plans and strategies

Medway Council Plan (2013 – 2015)

2.4.1 The Medway Council Plan is a business plan for the next two years. It sets out how the council will ensure that they provide the best possible services to residents. The strategy directly contributes to three of the five priority areas:

- Safe, clean and green Medway.
- Everybody travelling easily around Medway.
- Everyone benefiting from the area's regeneration.

2.4.2 Two core values set out the principles of how Medway will work to deliver these priorities.

- Putting customers at the centre of everything we do.
- Giving value for money.

Sustainable Community Strategy 2010 – 2026

2.4.3 The Sustainable Community Strategy is the overarching strategy for Medway and sets out the long-term vision and key ambitions for Medway and the priorities to deliver that vision. It sits alongside the Local Development Framework, which is the key spatial plan for Medway, guiding development within Medway to 2026. The strategy contributes towards the following ambitions and principles included within the Sustainable Community Strategy.

[9] Environment Agency, Defra (2011) Understanding the risks, empowering communities, building resilience. The national flood and coastal erosion risk management strategy for England.

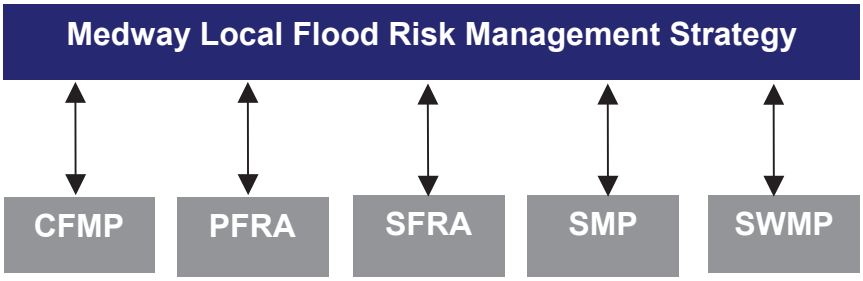
2.4.4 Ambitions:

- Medway to have a safe and high quality environment.

2.4.5 Principles:

- Sustainability: Will our actions work for tomorrow as well as today?
- Fairness: Do our actions take account of all sections of society, ensuring that everyone benefits from the regeneration of Medway?
- Self-help: Will our actions encourage people to take responsibility themselves to make things better?

2.4.6 The increased focus on flood risk over recent years is an important element of adaptation to climate change. It is important that this local strategy is not viewed as an isolated document, but one that connects with other strategic regional and local plans which are discussed in more detail below.



North Kent Rivers Catchment Flood Management Plan (CFMP) (December 2009)

2.4.7 The North Kent Rivers CFMP was published by the EA in 2009 and sets out policies for the sustainable management of flood risk over the long term (50 to 100 years) taking climate change into account. More detailed flood risk management strategies for individual rivers or sections of river sit under specific sub areas and policy units.

2.4.8 The CFMP emphasises the role of the floodplain as an important asset for the management of flood risk, the opportunities provided by new development and regeneration to manage risk, and the need to re-create river corridors so that rivers can flow and flood more naturally.

2.4.9 The CFMP will be periodically reviewed, approximately five years from when it was published, to ensure that it continues to reflect any changes in the catchment.

Medway Council Preliminary Flood Risk Assessment (PFRA) (September 2011)

2.4.10 In accordance with the requirements of the FRR 2009, Medway Council prepared a Preliminary Flood Risk Assessment (PFRA) in 2011. The PFRA contains information regarding past and future (potential) floods from local sources of flooding, which principally includes surface water, groundwater and ordinary watercourses.

2.4.11 In order to ensure a consistent national approach, DEFRA identified significance thresholds to be used for defining flood risk areas. The methodology is based on using national flood risk information to identify 1km squares where local flood risk is considered to be an issue. Where a cluster of grid squares leads to an area where flood risk is more concentrated and over 30,000 people are predicted to be at risk of flooding, this area has been identified as an 'Indicative Flood Risk Area'.

2.4.12 Of ten national Indicative Flood Risk Areas, one falls within Medway Council's administrative boundary. The PFRA provided an opportunity for Medway Council to contest the Indicative Flood Risk Area. The PFRA identified that while there is a potential risk of surface water flooding causing 'significant harmful consequences', limitations with the data available at the time of writing the PFRA provided insufficient evidence for Medway Council to contest the Indicative Flood Risk Area. Detailed surface water modelling undertaken as part of Surface Water Management Plan (SWMP) would present a more accurate picture of surface water flood risk in Medway.

Medway Council Strategic Flood Risk Assessment (SFRA) (August 2006)

2.4.13 A Strategic Flood Risk Assessment[10] (SFRA) for Medway was prepared in August 2006 by Mott Macdonald consultants. The SFRA included hydraulic modelling of tidal flood defence overtopping throughout the study area. Detailed mapping was provided presenting the flood depth and hazard ratings associated with different tidal flooding scenarios.

2.4.14 The SFRA provides a detailed assessment of the risk associated with tidal flooding, however there is little consideration of local sources of flooding, which are of importance to this strategy.

Medway Council Strategic Flood Risk Assessment Addendum (February 2011)

2.4.15 The original SFRA was completed prior to the issue of Planning Policy Statement 25 (PPS25; CLG December 2006) and as a result some of the policy implications required revision when PPS25 was published.

2.4.16 In addition, following the completion of the original SFRA, Mott Macdonald undertook a revised 2D tidal modelling exercise of the Lower Medway on behalf of the Environment Agency. This study was completed in 2007 and included the updated extreme water level information including climate change increases as set out in PPS25.

2.4.17 An addendum[11] to the original SFRA was prepared by Scott Wilson in 2011 to take account of updated hydraulic modelling information and the publication of PPS25.

[10] Mott Macdonald (August 2006) Medway Council Strategic Flood Risk Assessment
[11] Scott Wilson (2011) Addendum to the Medway Council Strategic Flood Risk Assessment

Medway Flood Defence Strategy: High Level Appraisal of Potential Solutions (February 2011)

2.4.18 This study was commissioned to determine the standard of protection and condition of the existing flood defence infrastructure in Medway to inform development and investment decisions. This included an economic analysis to estimate the likely damage costs attributed to flood events on a flood cell basis.

2.4.19 Potential flood risk management options were appraised in order to raise the standard of defence throughout Medway.

2.4.20 Medway Council is currently considering whether a Supplementary Planning Document should be prepared based in part on the revised SFRA and the High Level Appraisal to inform a strategic planning approach to the provision of new flood infrastructure.

Medway Estuary and Swale Shoreline Management Plan (SMP) (August 2010)

2.4.21 The SMP was published in 2010 by the Environment Agency. It provides a large-scale assessment of the risks associated with coastal evolution and presents a policy framework to address the risks in a sustainable manner with respect to people and to the developed, historic and natural environment.

Medway Council Surface Water Management Plan (SWMP) – forthcoming.

2.4.22 A SWMP is a plan, which outlines the preferred surface water management strategy in a given location. Medway Council will develop their SWMP in conjunction with other Risk Management Authorities who are responsible for surface water management and drainage in their area. Partners will work together to understand the causes and effects of surface water flooding and agree the most cost effective way of managing surface water flood risk for the long term. The key element to the SWMP will be the action plan which will influence future capital investment, drainage maintenance, public engagement and understanding, land use planning, emergency planning and future developments.

2.4.23 The data and actions and associated policy interventions will need to feed directly into the operational level of the council across many departments, in particular to special and emergency planning policies and designations and into the management of local authority controlled land.

2.5 Scrutiny and review of the strategy

Regeneration, Community and Culture

2.5.1 The Regeneration, Community and Culture Overview and Scrutiny Committee are the relevant scrutiny committee for flood and coastal erosion risk management. It plays a key role in developing and reviewing policy and holding Cabinet to account through a facility to call-in cabinet decisions for review or undertaking pre-decision scrutiny. It represents one of the most important ways in which Councillors can influence council policy and champion their constituents.

2.5.2 The FWMA 2010 amends the Local Government Act 2000 to include arrangements to review and scrutinise the flood management and coastal erosion risk management functions of RMA's, which may affect the Local Authorities area.

2.5.3 An annual report, agreed with all relevant RMA's, which provides information about performance and progress over the last financial year and plans for the upcoming financial year will be provided to the Overview and Scrutiny committee in April every year where there are plans for structural measures requiring funding.

Regional Flood and Coastal Committees (Southern Regional Flood and Coastal Committee).

2.5.4 Regional Flood and Coastal Committees scrutinise the Environment Agency's work. Medway is the Southern Region Regional Flood and Coastal Committee and has one Member on the committee from a total membership of 14. The committee is also responsible for administering the local levy, which is a fund paid into by each authority in the region according to the number of Band D properties in the authority. The local levy is described in Section 7.3.

3. Overview of Local Flooding in Medway

3.1 Overview

3.1.1 Part 1, Article 2, Section 9 Sub-section 4g of the FWMA states that the Strategy must specify 'the assessment of local flood risk for the purpose of the strategy'. This Section provides an overview of local flood risk across Medway based upon previously completed studies and new flood risk information generated specifically to inform the strategy.

3.2 Historical records

3.2.1 Over the last few years, Medway Council has maintained records of flooding events that have occurred within their administrative area. These are typically based on reports of flooding made by members of the public or identified by the responsive maintenance wardens in the Highways department. To date, the type of information captured typically includes the following fields:

- Date
- Address
- Incident type (burst water main, highway flooding, sewer flooding)
- Damage caused / clean up time
- Other relevant information from the informant

3.2.2 The FWMA places a duty on LLFAs to investigate and record significant flood events. As a result, it will be necessary for Medway Council to establish a formal method of flood incident recording within the council and make arrangements for the records to be captured and reviewed to enable identification of significant flood events. This is addressed further in Section 3.4.

3.2.3 In addition to records held by Medway Council, Southern Water also hold records of sewer flooding. Both these historic flooding datasets have been mapped in Figure 3.1.

3.3 Surface water (pluvial) flooding

3.3.1 Surface water flooding (also referred to as pluvial flooding) is caused as a result of high intensity rainfall over a long or short duration. Water, unable to enter into local drainage systems quickly enough, flows over the surface of the ground and ponds in low lying areas before entering watercourses or sewers as their capacity allows. Surface water flooding may

be exacerbated when receiving watercourses are full to capacity or where there are local issues with the drainage network including blockage or lack of gullies etc.

3.3.2 No single organisation has overall responsibility for surface water flooding, with different aspects of the drainage system falling to either The Highway Authority (in this case Medway Council), Southern Water, riparian owners and the Highways Agency for main routes (including the M2).

3.3.3 In order to develop local understanding of the nature of surface water flood risk across the study area, pluvial modelling has been undertaken across the entire administrative area for three annual probability rainfall events using the industry standard modelling package TuFLOW.

3.3.4 Rainfall profiles were estimated using the industry standard ReFH (Revitalised Flood Hydrograph) approach for the following annual probability rainfall events.

- 3.3% AEP (1 in 30 year)
- 1% AEP (1 in 100 year) plus climate change (+30%)
- 0.5% AEP (1 in 200 year)

3.3.5 The analysis of the 0.5% AEP event represents a worst case scenario to enable the council to ensure preparedness should such an event occur and to better understand the extent of those risks across the administrative area.

3.3.6 The full methodology and outputs for the pluvial modelling are presented in Technical Appendix 1: Pluvial Modelling Methodology[12]. Maximum flood depth mapping from the modelling is presented in Figures 3.1 to 3.3.

3.3.7 The PRFA estimated that 41,000 properties (of which approximately 35,700 are residential properties) would be at risk of surface water flooding. The pluvial modelling undertaken estimated that 24,300 properties are at risk (of which 14,200 are residential), representing a significant reduction due to the model refinements. Both of these estimates are based on the 0.5 % worst-case scenario.

3.3.8 Prior to approving the outputs of the hydraulic modelling, the results were verified against historic records of flooding. These provided a good correlation and a useful comparison from which to measure surface water flood risk in Medway. The historic records indicate that on average there have been three counts of internal flooding of property per year in Medway.

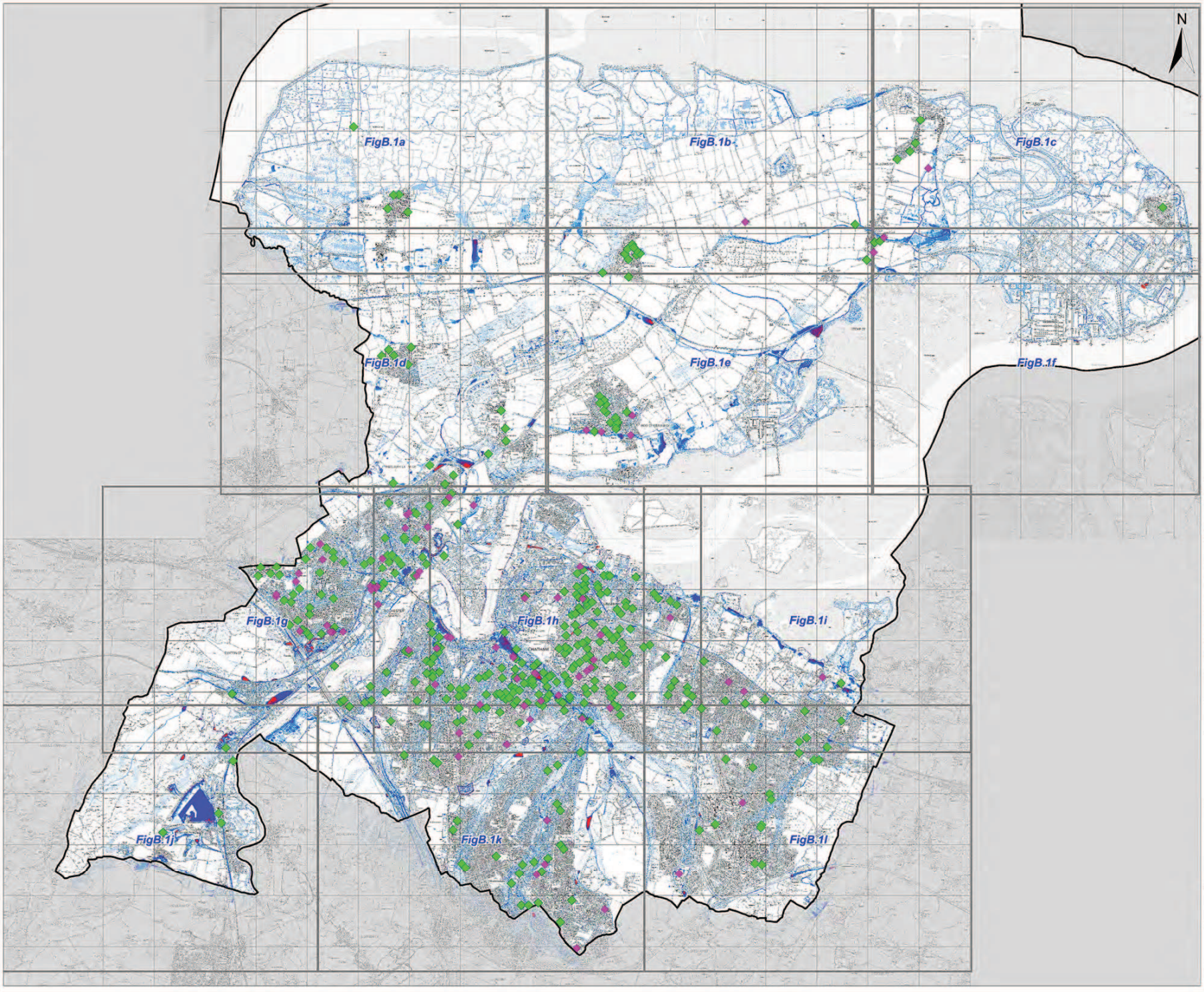
3.3.9 It is recognised that there remains uncertainty associated with the derivation of the estimates and therefore may still overestimate the risk of flooding from this source. To improve our understanding of surface water flood risks (and other sources of flooding), a Surface Water Management Plan will be undertaken in those areas in order to establish more accurate estimates and to identify Critical Drainage Areas.

3.3.10 Areas for inclusion in the SWMP will include those which have been identified as high risk by the modelling and areas where there are records of historic flooding. This includes but is not necessarily limited to the urban centres of Chatham, Rochester and Strood, as well as rural areas such as Stoke where there is a known problem associated with surface water flooding.

[12] Capita Symonds / URS (October 2013) Medway Council LFRMS Technical Appendix 1 Pluvial Modelling Methodology DRAFT

Figure 3.1 Pluvial Flooding Maximum Flood Depth 3.3% AEP (extract from Technical Appendix 1)

(This figure has been provided as a separate file:
MedwayCouncil-LocalFloodRiskManagementStrategy_Fig3.1_DepthMap_0030yr_001.pdf)



NOTES

KEY

- Medway Council Boundary

Maximum Flood Depth (m)

- < 0.1m
- 0.1m to 0.25m
- 0.25m to 0.5m
- 0.5m to 1.0m
- 1.0m to 1.5m
- > 1.5m

Flood Incidents

- Medway Council Recorded Flood Incidents
- Southern Water Recorded Flood Incidents

NOTES

1. Mapping of maximum flood depth and hazard rating categories has been generated from TuFLOW pluvial modelling results. Users of this map should refer to the Local Flood Risk Management Strategy Technical Appendix 1 Pluvial Modelling Methodology for a complete description of the limitations and accuracy of the maximum flood depth and hazard ratings shown.

2. This map only shows the predicted likelihood of pluvial flooding (this includes flooding from overland flow, small watercourses and ditches, that occurs during heavy rainfall) for defined areas, and due to the coarse nature of the source data used, are not detailed enough to account for precise addresses.

3. This map provides a strategic overview of pluvial flood risk and may be subject to further analysis in the future.

4. It should be noted that certain locations not shown may be at risk of flooding from other sources. For example, land adjacent to watercourses not included within this study; areas susceptible to drainage system inadequacies or localised ponding; areas flooded due to debris blockage.

DRAWN BY	CHECKED BY	PASSED BY	DATE
SJL	EC	SPR	OCT 2013

SCALES @ A3	ISSUING OFFICE
1:50,000	LONDON

MEDWAY COUNCIL LFRMS MAIN REPORT

MAXIMUM FLOOD DEPTH (m)

3.3% ANNUAL EXCEEDANCE PROBABILITY (AEP) EVENT AND RECORDED FLOOD INCIDENTS

Medway Council Serving You

CAPITA SYMONDS URS Flood Risk Management

DRAWING NUMBER	REV
Figure 3.1	02

REV 2

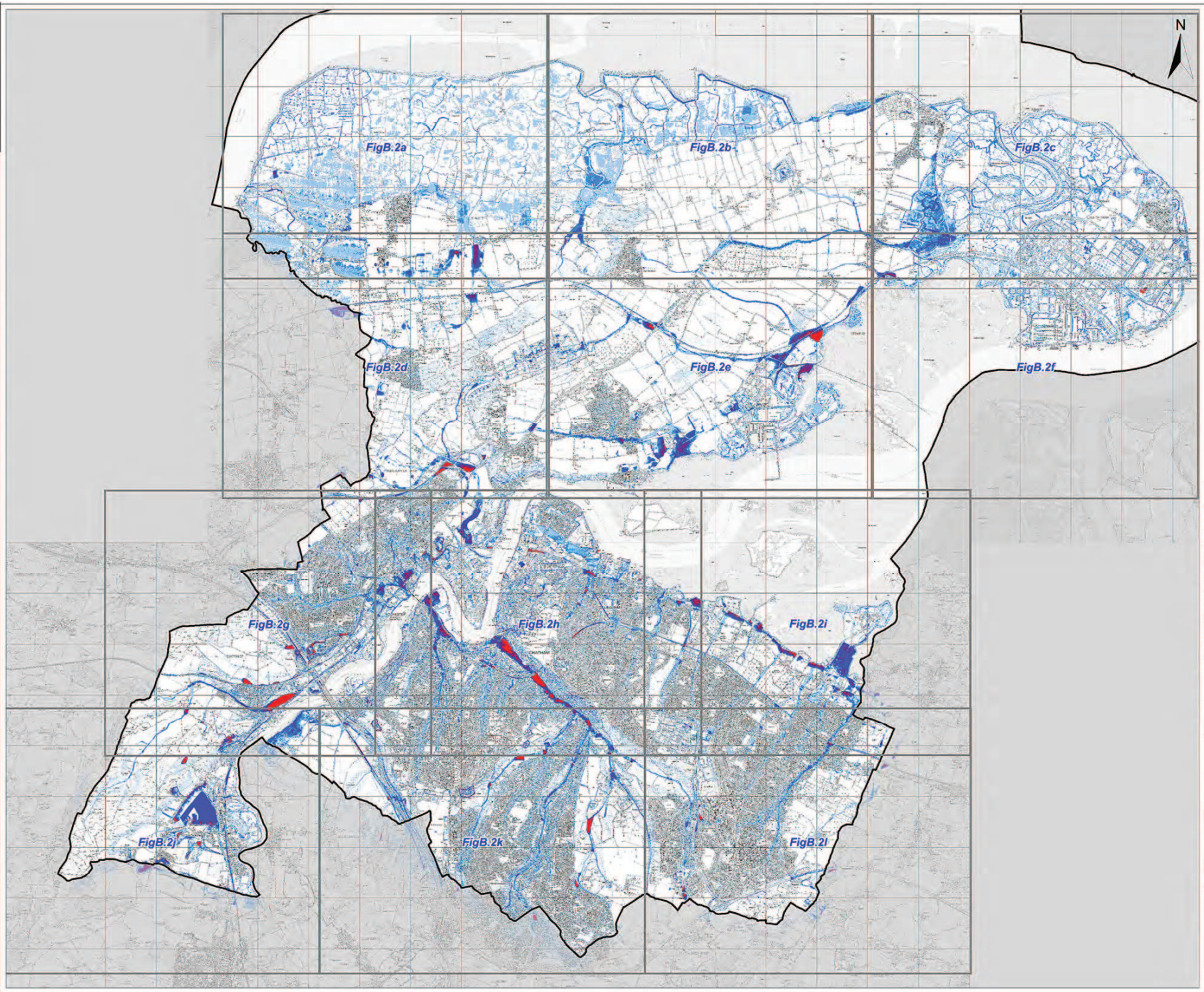
DRAWING NUMBER 47061941\Figure3.1

LAYOUT FILE NAME: Medway Council Local Flood Risk Management Strategy - Fig3.1_DepthMap_8000pi_002.WOR

Figure 3.2 Pluvial Flooding Maximum Flood Depth 1% AEP including climate change (extract from Technical Appendix 1)

(This figure has been provided as a separate file:

MedwayCouncil-LocalFloodRiskManagementStrategy_Fig3.2_DepthMap_0100yrCC_001.pdf)



NOTES

KEY

Medway Council Boundary

Maximum Flood Depth (m)

- < 0.1m
- 0.1m to 0.25m
- 0.25m to 0.5m
- 0.5m to 1.0m
- 1.0m to 1.5m
- > 1.5m

NOTES

1. Mapping of maximum flood depth and hazard rating categories has been generated from TuFLOW pluvial modelling results. Users of this map should refer to the Local Flood Risk Management Strategy Technical Appendix 1 Pluvial Modelling Methodology for a complete description of the limitations and accuracy of the maximum flood depth and hazard ratings shown.

2. This map only shows the predicted likelihood of pluvial flooding (this includes flooding from overland flow, small watercourses and ditches, that occurs during heavy rainfall) for defined areas, and due to the coarse nature of the source data used, are not detailed enough to account for precise addresses.

3. This map provides a strategic overview of pluvial flood risk and may be subject to further analysis in the future.

4. It should be noted that certain locations not shown may be at risk of flooding from other sources. For example, land adjacent to watercourses not included within this study; areas susceptible to drainage system inadequacies or localised ponding; areas flooded due to debris blockage.

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SJL	EC	SPR	OCT 2013

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1:50,000	LONDON

MEDWAY COUNCIL LFRMS
MAIN REPORT

MAXIMUM FLOOD DEPTH (m)

1.0% ANNUAL EXCEEDANCE PROBABILITY (AEP) EVENT PLUS 30% CLIMATE CHANCE

Medway Council
Serving You

CAPITA SYMONDS URS
Flood Risk Management

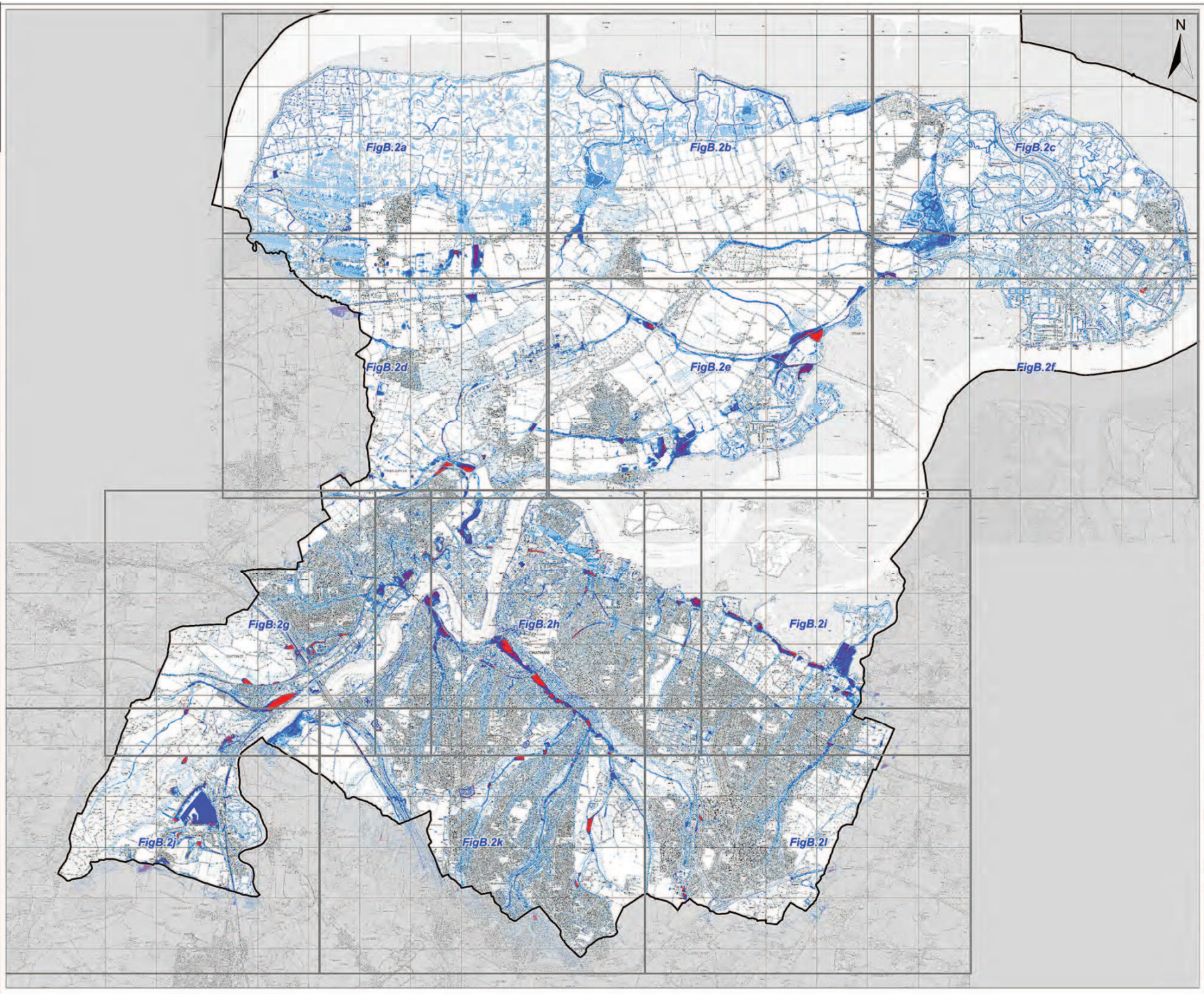
DRAWING NUMBER	REV
Figure 3.2	02

DRAWING NUMBER 47061941\Figure3.2 REV 2

LAYOUT FILE NAME: Medway Council Local Flood Risk Management Strategy - Fig 3.2_DepthMap_01Oct\GIS_002.WOR

Figure 3.3 Pluvial Flooding Maximum Flood Depth 0.5% AEP (extract from Technical Appendix 1)

(This figure has been provided as a separate file:
MedwayCouncil-LocalFloodRiskManagementStrategy_Fig3.3_DepthMap_0200yr_001.pdf)



NOTES

KEY

- Medway Council Boundary

Maximum Flood Depth (m)

- < 0.1m
- 0.1m to 0.25m
- 0.25m to 0.5m
- 0.5m to 1.0m
- 1.0m to 1.5m
- > 1.5m

NOTES

1. Mapping of maximum flood depth and hazard rating categories has been generated from TuFLOW pluvial modelling results. Users of this map should refer to the Local Flood Risk Management Strategy Technical Appendix 1 Pluvial Modelling Methodology for a complete description of the limitations and accuracy of the maximum flood depth and hazard ratings shown.

2. This map only shows the predicted likelihood of pluvial flooding (this includes flooding from overland flow, small watercourses and ditches, that occurs during heavy rainfall) for defined areas, and due to the coarse nature of the source data used, are not detailed enough to account for precise addresses.

3. This map provides a strategic overview of pluvial flood risk and may be subject to further analysis in the future.

4. It should be noted that certain locations not shown may be at risk of flooding from other sources. For example, land adjacent to watercourses not included within this study; areas susceptible to drainage system inadequacies or localised ponding; areas flooded due to debris blockage

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SJL	EC	SPR	OCT 2013

SCALES @ A3	ISSUING OFFICE
1:50,000	LONDON

MEDWAY COUNCIL LFRMS
MAIN REPORT

MAXIMUM FLOOD DEPTH (m)

1.0% ANNUAL EXCEEDANCE PROBABILITY (AEP) EVENT PLUS 30% CLIMATE CHANGE

Medway Council
Serving You

CAPITA SYMONDS URS
Flood Risk Management

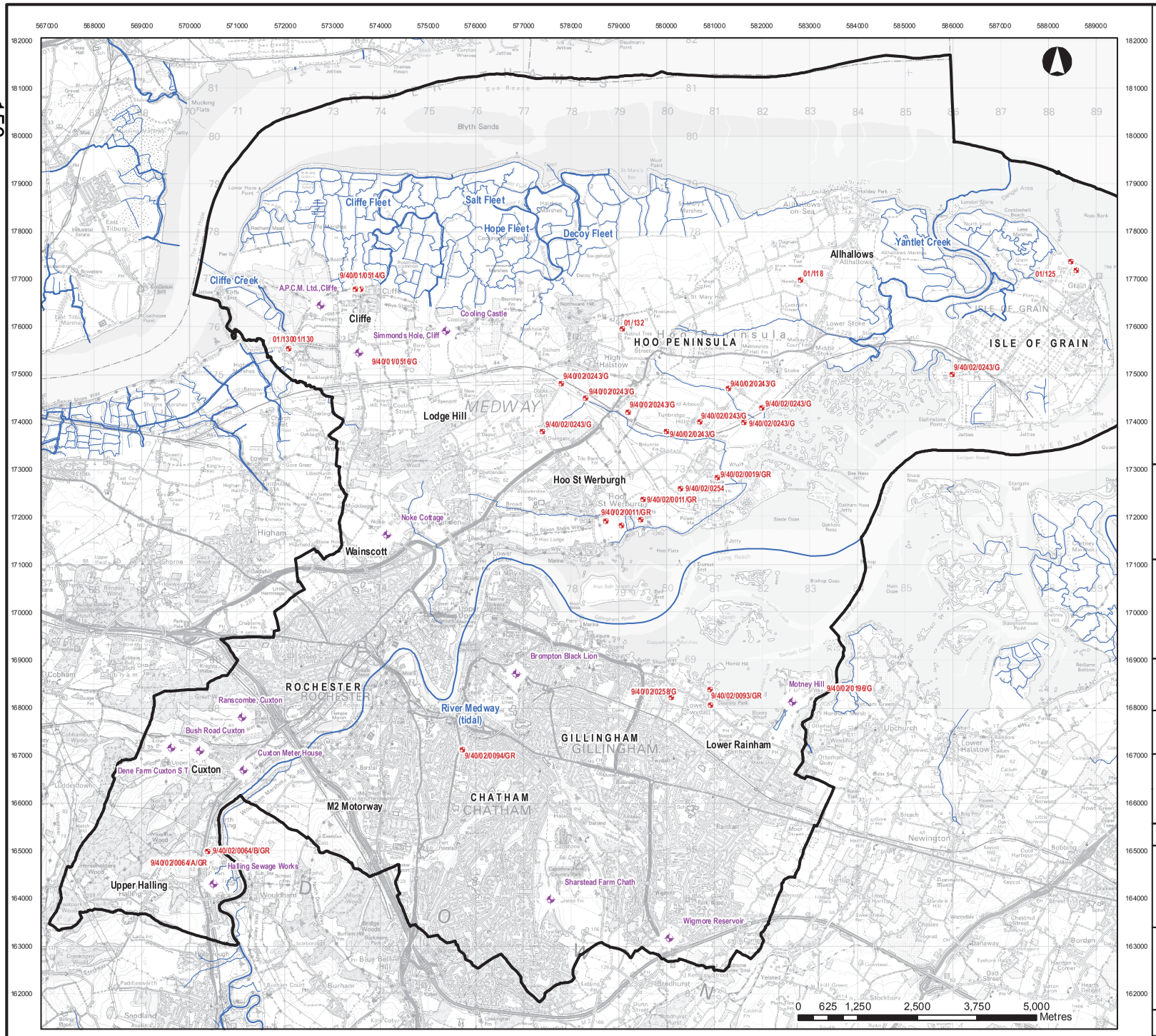
DRAWING NUMBER	REV
Figure 3.2	02

DRAWING NUMBER 47061941\Figure3.2
REV 2

LAYOUT FILE NAME: Medway Council Local Flood Risk Management Strategy - Fig 3.2_DepthMap_01\Layout\Fig_002.WOR

Figure 3.4 Areas susceptible to groundwater flooding (extract from Technical Appendix 2)

(This figure has been provided as a separate file:
MedwayCouncil-LocalFloodRiskManagementStrategy_Fig3.4_GroundwaterFlooding_001.pdf)



KEY

- Medway Council Administrative Area
- Environment Agency Observation Boreholes
- Licensed Groundwater Abstractions
- Rivers

USER NOTE
This plan has been produced in accordance with Planning Policy Statement 25 – development and flood risk. Because the information is indicative rather than specific, local planning authorities will nevertheless need to consult the Environment Agency on individual applications.

FLOODABLE AREAS NOT SHOWN
This study does not consider those areas susceptible to tidal, fluvial, surface water or pluvial flooding.

Medway Council

CAPITA SYMONDS | URS Flood Risk Management

STRATEGIC FLOOD RISK MAPPING

PROJECT TITLE

MEDWAY COUNCIL LFRMS
TECHNICAL APPENDIX 2
GROUNDWATER ASSESMENT

DRAWING TITLE

FIGURE 1
LOCATION MAP

ORIGINATED BY	DRAWN BY	CHECKED BY	APPROVED BY	SCALE	STATUS
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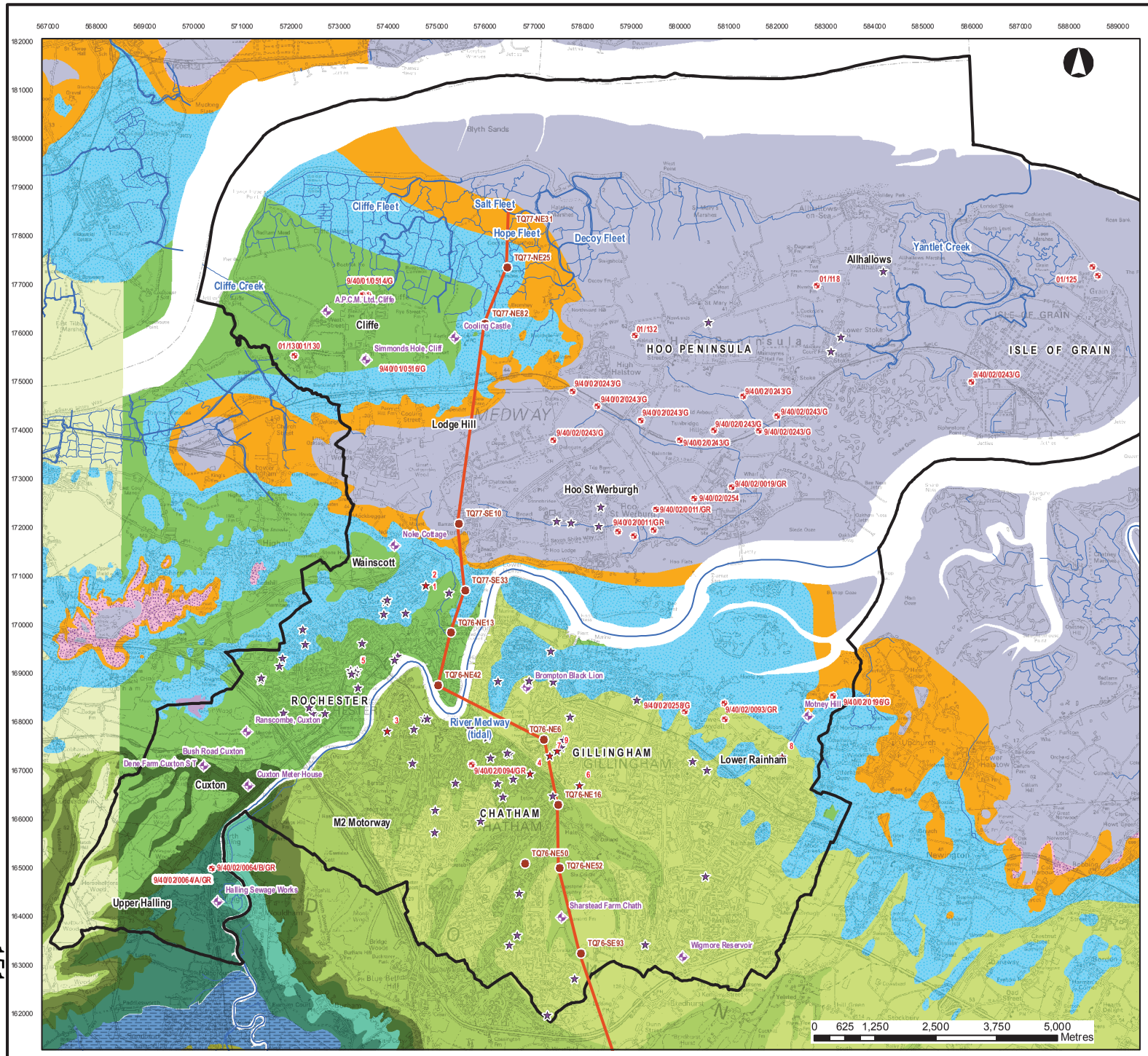

KEY

- Medway Council Administrative Area
- Rivers
- Historic Flooding Event (all events)
- Historic Flooding Event (basements / cellars)
- Environment Agency Observation Borehole
- Licensed Groundwater Abstraction
- BGS Borehole Log
- Geological Cross Section

Bedrock Geology

- Lenham Formation
- London Clay Formation
- Harwich Formation
- Lambeth Group
- Thanet Sand Formation
- Seaford Chalk Formation & Newhaven Chalk
- Seaford Chalk Formation
- Lewes Nodular Chalk Formation
- Lewes Nodular Chalk, Seaford Chalk and Newhaven Chalk Fm (Undiff)
- New Pit Chalk Formation
- Holywell Nodular Chalk Formation
- Zig Zag Chalk Formation
- West Melbury Marly Chalk Formation
- Gault Formation
- Folkestone Formation

USER NOTE
This plan has been produced in accordance with Planning Policy Statement 25 – development and flood risk. Because the information is indicative rather than specific, local planning authorities will nevertheless need to consult the Environment Agency on individual applications.

FLOODABLE AREAS NOT SHOWN
This study does not consider those areas susceptible to tidal, fluvial, surface water or pluvial flooding.

Medway Council

CAPITA SYMONDS | URS Flood Risk Management

STRATEGIC FLOOD RISK MAPPING

PROJECT TITLE

MEDWAY COUNCIL LFRMS
TECHNICAL APPENDIX 2
GROUNDWATER ASSESMENT

DRAWING TITLE

FIGURE 2
BEDROCK GEOLOGY MAP

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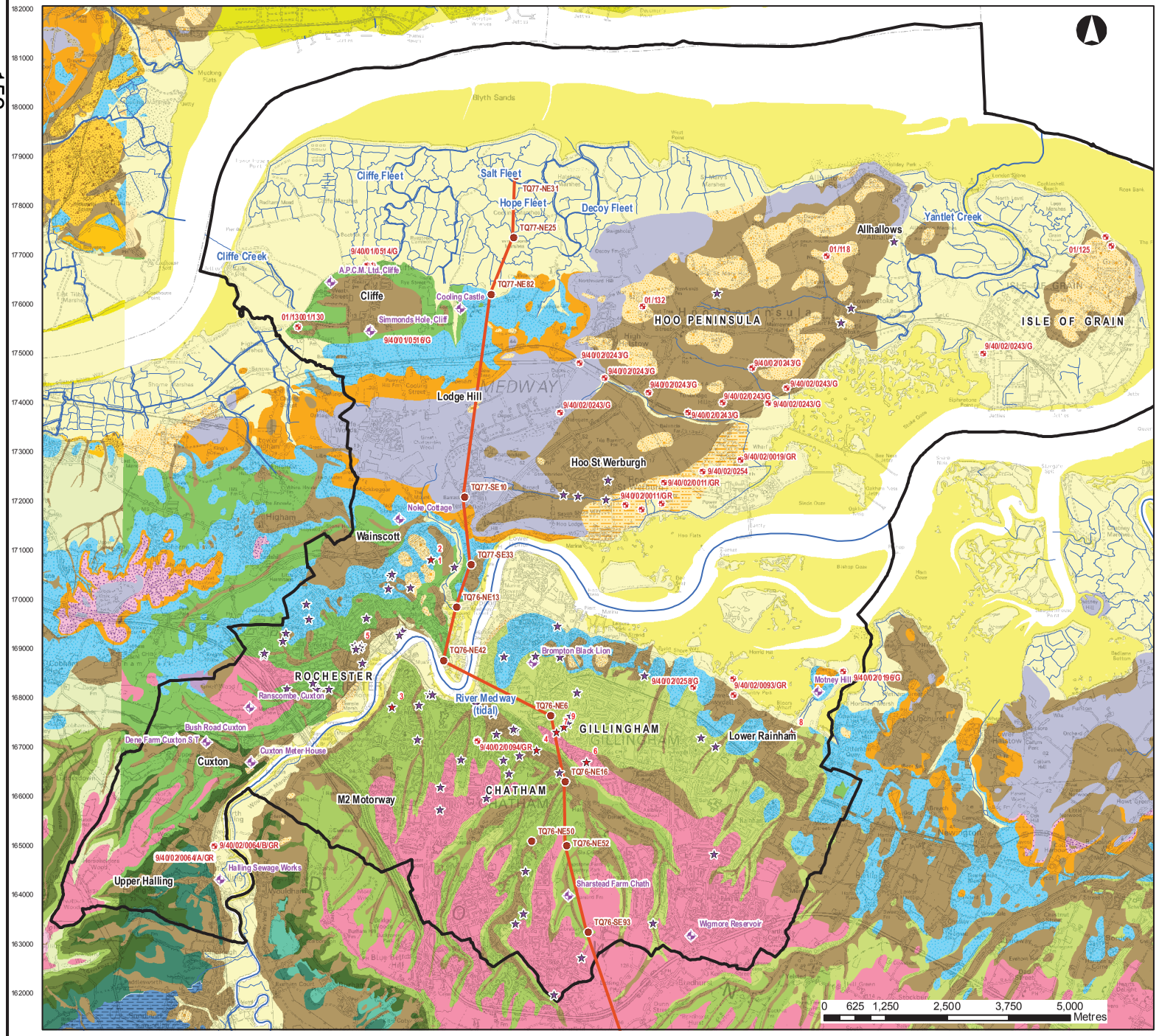


KEY

- Medway Council Administrative Area
- Rivers
- Historic Flooding Event (all events)
- Historic Flooding Event (basements / cellars)
- Environment Agency Observation Boreholes
- Licensed Groundwater Abstractions
- BGS Borehole Logs
- Geological Cross Section

Superficial Geology

- Head (Clay, Silt, Sand and Gravel)
- Alluvium (Clay, Silt, Sand & Gravel)
- Peat
- Beach & Tidal Flat Deposits (Undiff)
- Tidal Flat Deposits
- Tidal River Or Creek Deposits
- River Terrace Deposits - Sand_Gravel
- River Terrace Deposits - Clay_Silt
- River Terrace Deposits (Undiff)
- Kempton Park Gravel Formation
- Taplow Gravel Formation
- Lynch Hill Gravel Member
- Boyn Hill Gravel Member
- Black Park Gravel Member - Sand Gravel
- Chelsfield Gravel Formation
- Clay with Flints Formation - Clay Silt Sand Gravel

Bedrock Geology

- Lenham Formation
- London Clay Formation
- Harwich Formation
- Lambeth Group
- Thanet Sand Formation
- Seaford Chalk Formation & Newhaven Chalk
- Seaford Chalk Formation
- Lewes Nodular Chalk Formation
- Lewes Nodular Chalk, Seaford Chalk & Newhaven Chalk Fm (Undiff)
- New Pit Chalk Formation
- Holywell Nodular Chalk Formation
- Zig Zag Chalk Formation
- West Melbury Marly Chalk Formation
- Gault Formation
- Folkestone Formation

USER NOTE
This plan has been produced in accordance with Planning Policy Statement 25 – development and flood risk. Because the information is indicative rather than specific, local planning authorities will nevertheless need to consult the Environment Agency on individual applications.

FLOODABLE AREAS NOT SHOWN
This study does not consider those areas susceptible to tidal, fluvial, surface water or pluvial flooding.

Medway Council

CAPITA SYMONDS | URS Flood Risk Management

STRATEGIC FLOOD RISK MAPPING

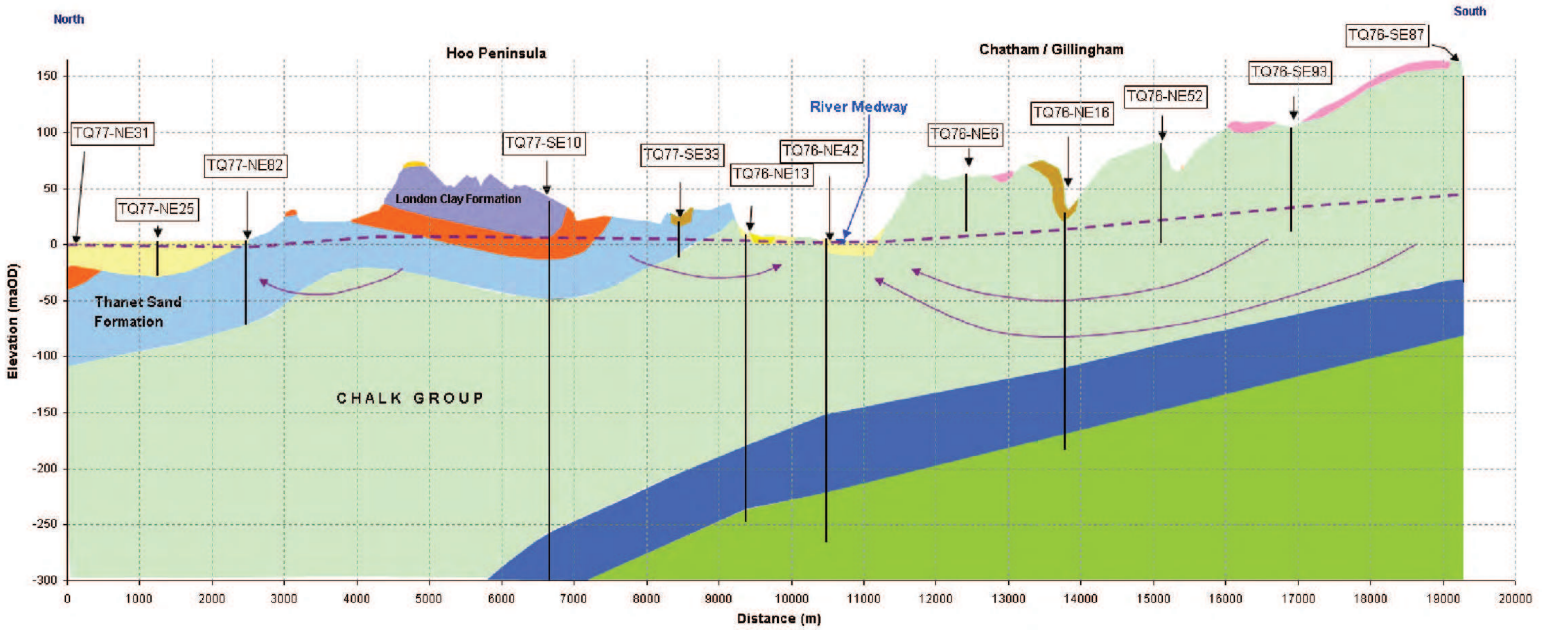
PROJECT TITLE

MEDWAY COUNCIL LFRMS
TECHNICAL APPENDIX 2
GROUNDWATER ASSESMENT

DRAWING TITLE

FIGURE 3
BEDROCK & SUPERFICIAL
GEOLOGY MAP

ORIGINATED BY	DRAWN BY	CHECKED BY	APPROVED BY	SCALE	STATUS
BTV	BTV	SC	SC	Scale @ A3 1:80,000	FINAL
DATE 08/06/2012	DATE 08/06/2012	DATE 08/06/2012	DATE 08/06/2012	DRAWING NUMBER 47061941_GW_DRW002	REVISION 2



KEY

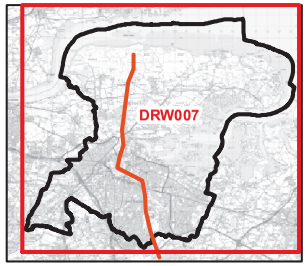
Superficial Geology

- Head (Clay, Silt, Sand and Gravel)
- Alluvium (Clay, Silt, Sand & Gravel)
- Beach & Tidal Flat Deposits (Undiff)
- Clay with Flints Formation - Clay Silt Sand Gravel

Bedrock Geology

- London Clay Formation
- Lambeth Group
- Thanet Sand Formation
- Chalk Formation (Undifferentiated)
- Gault Formation
- Folkestone Formation
- Groundwater Piezometery
- Inferred Groundwater Flow Direction

KEY PLAN



CAPITA SYMONDS URS
Flood Risk Management

STRATEGIC FLOOD RISK MAPPING

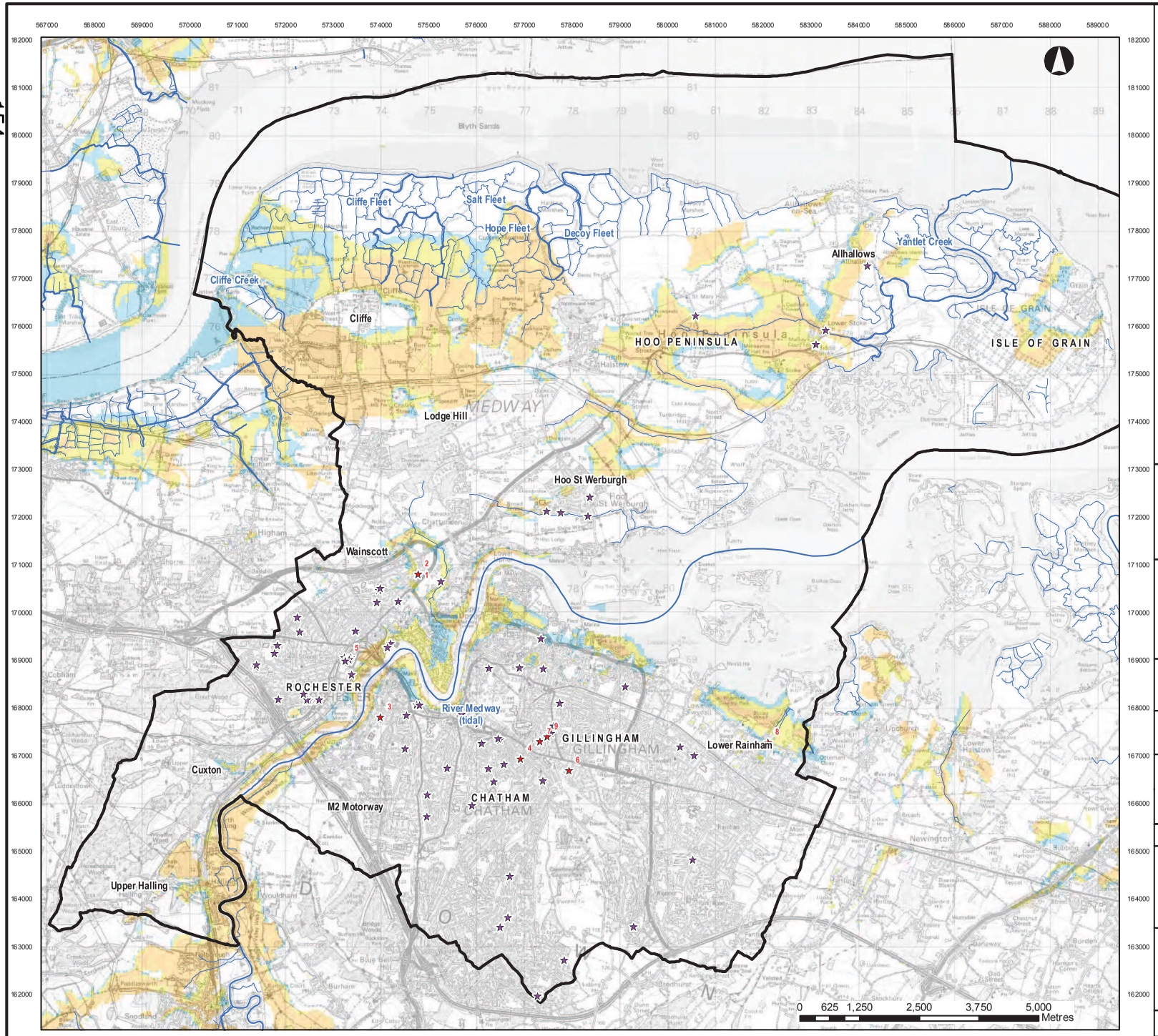
PROJECT TITLE

MEDWAY COUNCIL LFRMS
TECHNICAL APPENDIX 2
GROUNDWATER ASSESMENT

DRAWING TITLE

FIGURE 4
BGS GEOLOGICAL CROSS SECTION

ORIGINATED BY	DRAWN BY	CHECKED BY	APPROVED BY		STATUS
CW	CW	SC	SC		FINAL
DATE	DATE	DATE	DATE	DRAWING NUMBER	REVISION
23/04/2012	23/04/2012	26/04/2012	26/04/2012	47061941_GW_DRW007	2



KEY

- Medway Council Administrative Area
- Rivers
- Historic Flooding Event (all events)
- Historic Flooding Event (basements / cellars)

BGS Groundwater Flooding Susceptibility

- Very High
- High
- Moderate

TECHNICAL NOTE
This map shows an approximate guide to areas that may be susceptible to groundwater flooding. However, for all new developments, site investigation is required to confirm local groundwater levels and therefore risk of groundwater flooding

USER NOTE
This plan has been produced in accordance with Planning Policy Statement 25 – development and flood risk. Because the information is indicative rather than specific, local planning authorities will nevertheless need to consult the Environment Agency on individual applications.

FLOODABLE AREAS NOT SHOWN
This study does not consider those areas susceptible to tidal, fluvial, surface water or pluvial flooding.

Medway Council

CAPITA SYMONDS | URS
Flood Risk Management

STRATEGIC FLOOD RISK MAPPING

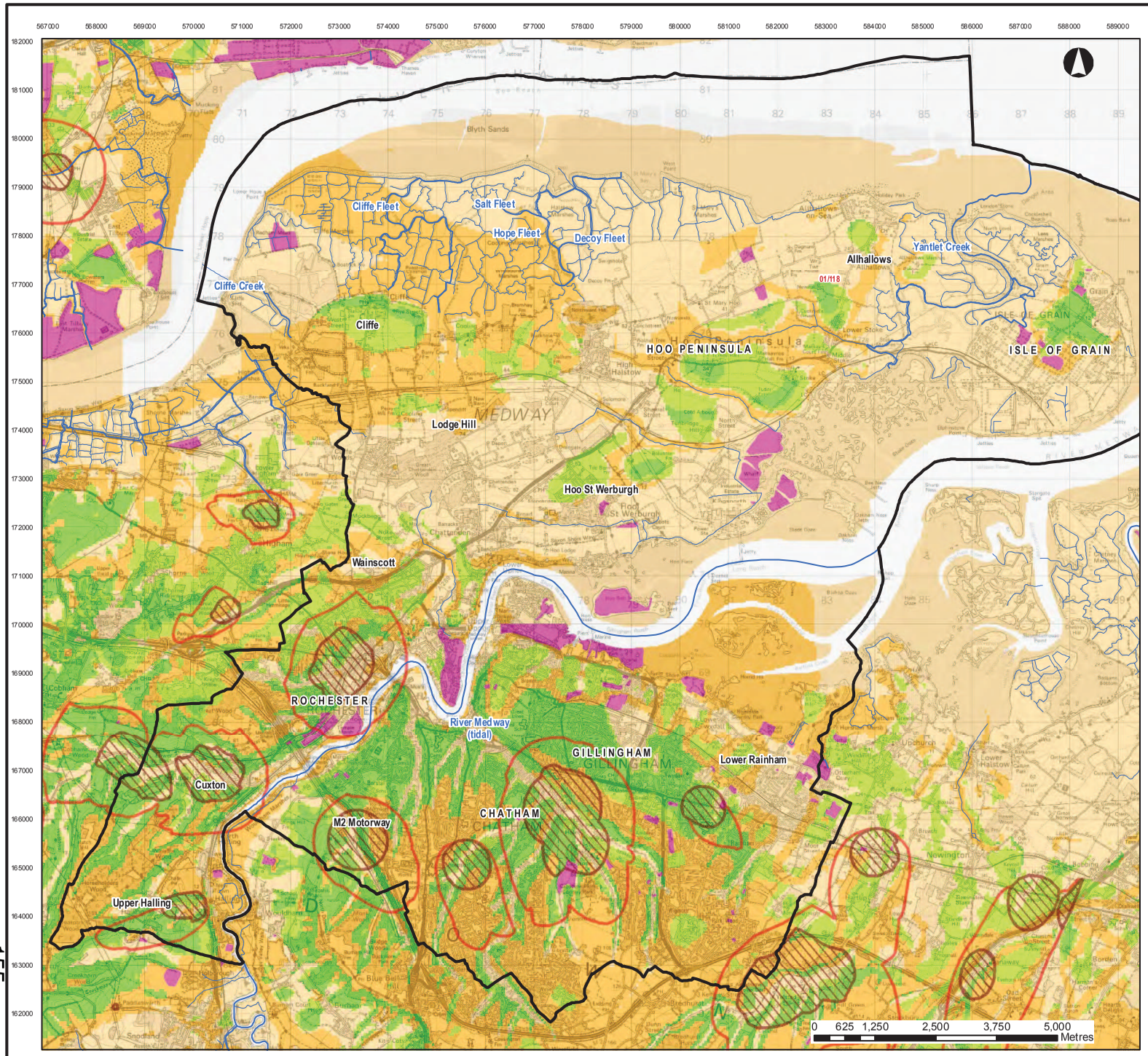
PROJECT TITLE

MEDWAY COUNCIL LFRMS
TECHNICAL APPENDIX 2
GROUNDWATER ASSESMENT

DRAWING TITLE

FIGURE 5
BGS GROUNDWATER FLOODING
SUSCEPTIBILITY MAP

ORIGINATED BY	DRAWN BY	CHECKED BY	APPROVED BY	SCALE	STATUS
BTV	BTV	SC	SC	Scale @ A3 1:80,000	FINAL
DATE 08/06/2012	DATE 08/06/2012	DATE 08/06/2012	DATE 08/06/2012	DRAWING NUMBER 47061941_GW_DRW001	REVISION 2



KEY

- Medway Council Administrative Area
- Rivers

Historic Landfill Sites

- Historic Landfill Sites

Groundwater Source Protection Zones

- Inner Zone (Zone 1)
- Outer Zone (Zone 2)

BGS Infiltration SUDS Suitability

- Highly Compatible for Infiltration SUDS
- Probably Compatible for Infiltration SUDS
- Opportunities for bespoke Infiltration SUDS
- Very Significant Constraints are indicated

TECHNICAL NOTE
This map forms an approximate guide to infiltration SUDS suitability.
However, for all new developments, site investigation is required to confirm local permeabilities and infiltration rates.

USER NOTE
This plan has been produced in accordance with Planning Policy Statement 25 – development and flood risk. Because the information is indicative rather than specific, local planning authorities will nevertheless need to consult the Environment Agency on individual applications.

FLOODABLE AREAS NOT SHOWN
This study does not consider those areas susceptible to tidal, fluvial, surface water or pluvial flooding.

Medway Council

CAPITA SYMONDS | URS
Flood Risk Management

STRATEGIC FLOOD RISK MAPPING

PROJECT TITLE

MEDWAY COUNCIL LFRMS
TECHNICAL APPENDIX 2
GROUNDWATER ASSESMENT

DRAWING TITLE

FIGURE 6
INFILTRATION SUDS SUITABILITY MAP

ORIGINATED BY	DRAWN BY	CHECKED BY	APPROVED BY	SCALE	STATUS
BTV	BTV	SC	SC	Scale @ A3 1:80,000	FINAL
DATE 08/06/2012	DATE 08/06/2012	DATE 08/06/2012	DATE 08/06/2012	DRAWING NUMBER 47061941_GW_DRW001	REVISION 2

3.4 Groundwater flooding

3.4.1 Groundwater flooding occurs as a result of water rising up from an underlying aquifer. This tends to occur after much longer periods of sustained rainfall, and the areas at most risk are often low-lying where the water table is likely to be at shallow depth. Groundwater flooding is known to occur in areas underlain by principal aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels.

3.4.2 Groundwater flooding tends to occur sporadically in both location and time, and tends to last longer than fluvial, pluvial or sewer flooding. Basements and tunnels can flood, buried services may be damaged, and storm sewers may become ineffective, exacerbating the risk of surface water flooding. Groundwater flooding can also lead to the inundation of farmland, roads, commercial, residential and amenity areas.

3.4.3 It is also important to consider the impact of groundwater level conditions on other types of flooding e.g. fluvial, surface water and sewer. High groundwater level conditions may not lead to widespread groundwater flooding. However, they have the potential to exacerbate the risk of surface water and fluvial flooding by reducing rainfall infiltration capacity, and to increase the risk of sewer flooding through sewer / groundwater interactions.

3.4.4 The need to improve the management of groundwater flood risk in the UK was identified through Defra's Making Space for Water strategy[13]. In order to develop local understanding of the nature of flood risk across the study area an assessment of the susceptibility of the area to groundwater flooding was undertaken[14]. This was a desk study based assessment using widely available sources of information as outlined in Technical Appendix 2 Groundwater Assessment.

3.4.5 To assist in the assessment of susceptibility to groundwater flooding conceptual models of the local geology and hydrogeological situation were developed. Based on this information likely groundwater flooding mechanisms were identified which were verified against available historical records of potential groundwater flooding.

3.4.6 This process, in tandem with a review of British Geological Survey mapping on groundwater flooding susceptibility enabled identification of those areas within Medway susceptible to groundwater flooding.

[13] Defra (February 2005) Making Space for Water
[14] Capita Symonds / URS (October 2013) Medway Council LFRMS Technical Appendix 2 Assessment of Susceptibility to Groundwater Flooding (DRAFT).

3.4.7 The conclusion of the assessment is the identification of the southern half of Medway's administrative area as having a degree of susceptibility to groundwater flooding due to the presence of the Chalk and Thanet Sands formations. The assessment also concludes that areas of Hoo St Werburgh and Allhallows may also be at risk from perched groundwater within head and River Terrace deposits in these areas.

3.5 Ordinary watercourse flooding

3.5.1 Ordinary watercourse flooding includes flooding from small open channels and culverted urban watercourses. The Detailed River Network (DRN) has been provided by the Environment Agency and enables identification of non-Main Rivers within Medway. In the southern half of Medway, there are few known ordinary watercourses; it is likely that some previously open channel watercourses have been entirely culverted and are now incorporated into the Southern Water sewer network as storm relief sewers. However, in the north Medway, there are extensive networks of small channels and ditches that cover the low-lying areas and drain to the tidal estuary.

3.5.2 The capacity and condition of ordinary watercourses is essential to the operation of the local drainage system and culverted watercourses are especially vulnerable to future flood risk. However, as noted in the Surface Water Management Plan (SWMP) Guidance[15] data on ordinary watercourses is frequently very sparse.

3.5.3 The Environment Agency has statutory and supervisory powers with regard to flooding from designated main rivers. However, the responsibility for maintenance of small open channels and culverted urban watercourses which are not designated as main river falls to Medway Council, Medway Internal Drainage Board and riparian owners who own land on either bank i.e. Medway Council is only responsible for ordinary watercourses where land on either bank is in council ownership, or where historical agreements have been made.

3.5.4 Changes to ordinary watercourse consenting have been made by the FWMA. In particular paragraph 32 (principally) of Schedule 2 of the FWMA amends Section 23 of the Land Drainage Act 1991[16]. Local Authorities will now lead on ordinary watercourse consenting and enforcement unless it is in an Internal Drainage District where Internal Drainage Boards (IDBs) will retain their existing powers. The Land Drainage Act 1991 makes provisions for ordinary watercourse regulation undertaken by Local Authorities.

[15] Defra (March 2010) Surface Water Management Plan Technical Guidance
[16] HMSO and the Queen's Printer of Acts of Parliament (1991) Land Drainage Act

3.5.5 One of the known areas of ordinary watercourse flooding in Medway is that associated with the ordinary watercourse that passes along the rear of properties on the southern edge of Hoo St Werburgh. This watercourse has been culverted at various points along its length as it passes through gardens of private properties. This culverting may have led to a reduction in the capacity of the channel, which has historically caused localised flooding of gardens and properties. This has been exacerbated in the past by fly tipping of garden waste into the watercourse.

3.6 Climate Change

3.6.1 The world's weather and climate is continually changing, resulting in both long and short term variations to weather patterns. In the UK, evidence suggests a shift towards generally wetter winters and a greater proportion of precipitation to fall as heavy rainfall events. The UK has a long-term framework for building the UK's ability to adapt to a changing climate as outlined in the Climate Change Act 2008.

3.6.2 The strategy has included pluvial modelling. In order to provide a robust evidence base, an allowance for climate change over the next 100 years has been added to rainfall boundaries included in the pluvial modelling in accordance with the Technical Guidance to the NPPF (an increase of 30%).

3.7 Flood Incident Reporting

3.7.1 The FWMA places a duty on LLFAs to investigate flood incidents from surface water, groundwater and ordinary watercourses, where it considers it 'necessary and appropriate'. In order to assist with these requirements, a threshold for undertaking a flood incident report has been developed by Medway Council as follows:

3.7.2 A formal flood incident report will be carried out where one or more of the following criteria are met (supported by hydraulic modelling where appropriate):

- ≥ 1 report of flooding of the interior of a domestic property from 1 event;
- ≥ 1 report of flooding of the interior of a business premises from 1 event;
- ≥ 1 report of external flooding of five or more properties;
- ≥ 1 report of flooding of critical infrastructure;

3.7.3 Flooding causing a transport link to be impassable for a significant period (significant being as Table 1 of the UKRLG code of Practice for Highways Maintenance)

- ≥ 15 reports of flooding within 50m of the receptor in the past 3 years

4. Managing Flood Risk in Medway

4.1 Overview

4.1.1 Part 1, Article 2, Section 9 Sub-section 4a of the FWMA states that a local strategy must specify 'the Risk Management Authorities in the authority's area'. Under Sub-section 4b it also states that a strategy must specify 'the flood and coastal erosion risk management functions that may be exercised by those authorities in relation to the area'.

4.2 Risk Management Authorities (RMAs)

4.2.1 In accordance with the Flood and Water Management Act, a RMA may include the Environment Agency, LLFA, and District Council for an area for which there is no Unitary Authority, an Internal Drainage Board, a water company and a Highway Authority.

4.2.2 The following RMAs have therefore been identified across Medway Council's administrative area:

- Medway Council (LLFA)
- Environment Agency
- Medway Council as the Highways Authority
- Lower Medway Internal Drainage Board (IDB)
- Southern Water

4.2.3 Though not formally designated as RMAs by the FWMA, the following groups or organisations have roles and functions in flood risk management.

- Regional Flood and Coastal Committee (RFCC).
- SE7 Regional Consortium.
- 11 Parish Councils.
- Network Rail.
- Kent Resilience Forum.
- Kent Fire and Rescue Service.
- Land owners and land managers.
- South East Water.
- Rochester Bridge Trust.
- The public.

4.3 Roles and responsibilities

4.3.1 Information included in Appendix 4 sets out some of the key duties, powers, roles and responsibilities of each of the RMAs. It should be noted that these tables are not exhaustive, and the source documents and legislation should always be referred back to for further information and clarification.

4.4 Information and Skill Sharing

4.4.1 It is essential that RMAs work together to achieve the functions set out in recent legislation. Effective sharing of information between RMAs can go a long way towards this aim.

4.4.2 Section 14 of the FWMA gives Medway Council, as the LLFA, the power to request information in connection with its flood risk management functions. It also states that information requested must be provided in the manner and within the period specified in the request.

4.4.3 'Information' can cover any data, documents or facts recorded in any form and includes paper files, notes, reports, databases, spreadsheets, drawings and plans, photographs and videos, electronic documents, emails, etc. There is a vast amount of data, in these different forms, held by a number of different RMAs; the challenge will be identifying what information exists and where it is held. This process was initiated during the preparation of the PFRA when data was collected from different RMAs. This data has provided the overall evidence base of flood risk information, which will inform future flood risk management work.

4.5 Role of the public and businesses

4.5.1 Members of the public have an important role to play in the context of local flood risk management. In many cases, the council and other RMAs will be reliant on information from local residents and business owners in order to be able identify the mechanisms and impacts of flood events. It is important that this information is directed to the council and acted upon where appropriate to fulfil the requirements of the FMWA and thereby continue to assist in the management of local flood risk.

4.5.2 As well as informing the council of areas experiencing flooding, the public also have a role to play in finding out whether they are at risk, and if so, implementing flood risk management measures where they are responsible for protecting their properties. These may include good housekeeping measures such as the careful management of surface water from their gardens and hard standing surfaces, the maintenance of open watercourses and ditches associated with their properties or the installation of flood protection measures during flood warnings. The

Environment Agency's website (www.environment-agency.gov.uk) provides a comprehensive resource on preparing for flooding. The on-line information is supported by a number of information leaflets including:

4.5.3 'Living on the edge'[17] provides a useful guide to the rights and responsibilities of those who own land adjacent to main rivers and ordinary watercourses.

4.5.4 'Prepare your property for flooding[18]' is a guide for householders and small businesses on preparing for flooding.

4.5.5 In order for local residents to fulfil their responsibilities of reporting flood incidents to the council and undertaking management measures for their own properties and local areas, local groups of residents or property owners may consider establishing local partnerships or flood working groups to tackle flood risk issues together.

4.6 Role of developers

4.6.1 Developers have a vital role to play in delivering the outcomes of the strategy. Developers should take note of the information contained within the strategy and work collaboratively with the LLFA and other RMAs in Medway to assist the delivery of local flood risk management for the benefit of all who live or work in Medway.

[17] Environment Agency (2007) Living on the edge - a guide to the rights and responsibilities of riverside occupation. 3rd Edition.
[18] Environment Agency (2009) Prepare your property for flooding, A guide for householders and small businesses

5. Local Flood Risk Management Objectives

5.1 Overview

5.1.1 Part 1, Article 2, Section 9 Sub-section 4c of the FWMA states that a strategy must specify 'the objectives for managing local flood risk', (including any objectives included in the authority's flood risk management plan prepared in accordance with the FRR 2009).

5.2 Identification of Flood Risk Management objectives

5.2.1 In order to steer the development of local flood risk management objectives for Medway Council, a review of the objectives set out in the Environment Agency's overarching National Flood and Coastal Erosion Risk Management Strategy has been undertaken. In addition to the five national objectives, the National Strategy also sets out six high-level principles by which it suggests that decisions relating to flood risk management and the processes by which they are taken should be guided. These guiding principles are as follows:

- Community focus and partnership working.
- A catchment and coastal "cell" based approach.
- Sustainability.
- Proportionate, risk-based approaches.
- Multiple benefits.
- Beneficiaries should be encouraged to invest in risk management.

5.2.2 The local objectives for this strategy have been developed in line with the five strategic objectives and the six guiding principles set out in the National Strategy. A workshop was held with members of Medway Council to identify and capture flood risk management objectives. Representatives were invited from a range of departments to contribute to the development of the council's flood risk management objectives. These objectives are set out in Table 5.1.

5.2.3 The FWMA requires Medway Council to agree its measures with other RMAs and the public and therefore will be agreed following a period of consultation.

Table 5.1 Medway Council's flood risk management objectives

		Adherence of local objectives to National Strategy Guiding Principles					
	GP1 Community focus and partnership working GP2 A catchment and coastal "cell" based approach GP3 Sustainability GP4 Proportionate, risk-based approaches GP5 Multiple benefits GP6 Beneficiaries should be encouraged to invest in risk management	1	2	3	4	5	6
National Strategy Objective 1: Understand the risks *Understanding the risks of flooding and coastal erosion, working together to put in place long-term plans to manage these risks and making sure that other plans take account of them.*							
1a	Medway Council will work with internal and external stakeholders to develop a collective understanding of local flood risk to enable successful local flood risk management.	■					
1b	Medway Council will monitor flood risk		■				
National Strategy Objective 2: Prevent inappropriate development *Avoiding inappropriate development in areas of flood and coastal erosion risk and being careful to manage land elsewhere to avoid increasing risks.*							
2a	Medway Council will ensure local policy is consistent with wider flood risk management policies and legislation at a national and regional level and provide clear advice on how to achieve these policies within Medway.			■			
2b	Medway Council will promote the use of SuDS in accordance with its forthcoming role as SuDS Advisory Body and the forthcoming Defra National Standards			■		■	
2c	Medway Council will take account of the cumulative effect of developments and climate change on the risk of flooding			■			

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Adherence of local objectives to National Strategy Guiding Principles

		GP1 Community focus and partnership working GP2 A catchment and coastal "cell" based approach GP3 Sustainability GP4 Proportionate, risk-based approaches GP5 Multiple benefits GP6 Beneficiaries should be encouraged to invest in risk management	1	2	3	4	5	6
	throughout Medway.							
2d	Medway Council will seek to ensure that all development has a positive or nil effect on the risk of flooding to and arising from proposed development.							
National Strategy Objective 3: Manage the likelihood of flooding *Building, maintaining and improving flood and coastal erosion management infrastructure and systems to reduce the likelihood of harm to people and damage to the economy, environment and society.*								
3a	Medway Council will consider how future infrastructure improvements (e.g. highways, rail, public realm works) and/or changes could be used to deliver flood risk / surface water management benefits.							
3b	Medway Council will use flood risk information to implement a risk-based approach to capital investment decisions and maintenance programmes and activities.							
3c	Medway Council will give consideration to the economical, social and environmental benefits and limitations of flood risk management measures when making investment decisions.							
National Strategy Objective 4: Help people manage their own risk *Increasing public awareness of the risk that remains and engaging with people at risk to encourage them to take action to manage the risks that they face and to make their property more resilient.*								

Adherence of local objectives to National Strategy Guiding Principles

		GP1 Community focus and partnership working GP2 A catchment and coastal "cell" based approach GP3 Sustainability GP4 Proportionate, risk-based approaches GP5 Multiple benefits GP6 Beneficiaries should be encouraged to invest in risk management	1	2	3	4	5	6
4a	Medway Council will share information with respect to flood risk across Medway with all Risk Management Authorities and the public.		■					
4b	Medway Council will increase public awareness (property owners, developers) with respect to flood risk and responsibility for flood risk management.		■					■
National Strategy Objective 5: Improve flood prediction, warning and post-flood recovery *Improving the detection, forecasting and issue of warnings of flooding, planning for and co-ordinating a rapid response to flood emergencies and promoting faster recovery from flooding.*								
5a	Medway Council will use information on flood risk as a tool for flood prediction and warning.		■					
5b	Medway Council will ensure that emergency plans and responses to flood incidents in Medway are effective.		■			■		
5c	Medway Council will ensure that communities understand the risks and their role and our role during an emergency.		■			■		

6. Measures for Managing Flood Risk

6.1 Overview

6.1.1 Part 1, Article 2, Section 9 Sub-section 4d of the FWMA states that a local strategy must specify 'the measures proposed to achieve those objectives'. Section 4e goes on to state that a strategy must specify 'how and when the measures are expected to be implemented'.

6.2 Identification of Flood Risk Management measures

6.2.1 In order to identify appropriate measures to achieve the flood risk management objectives set by Medway Council, a second workshop event was held with council staff, representing a range of departments.

6.2.2 For each of the objectives, initial ideas for potential measures were identified for further consideration. These are presented in Table 6.1.

6.2.3 Medway Council are not yet in a position to confidently identify critical drainage areas or significant flood risk areas across the administrative area due to the quality of flood record datasets. As a result, it is considered that identification of structural measures for flood risk areas would be inappropriate at this time. This information will be provided at a later date in a Surface Water Management Plan (SWMP). The strategy instead focuses on non-structural measures that can be implemented, especially building up the baseline of historic flood records, to enable the robust identification of critical drainage areas / significant flood risk areas and associated structural measures over the coming years.

6.2.4 The FWMA requires Medway Council to agree its measures with other RMAs and the public. This will be agreed following a period of consultation.

6.2.5 The identification of structural measures required to deliver objectives identified in the strategy will be a deliverable of the SWMP. The SWMP will include a description of the approach adopted to assess these measures. The approach may include cost benefit analysis, and/or a prescribed scoring criteria etc. and will feed into future updates of the strategy.

6.2.6 Table 6.1 provides an overview of the flood risk management measures that have been identified by Medway Council along with the RMA best placed to lead on its implementation.

6.2.7 Table 6.1 also provides an indication of the timeframe by which the measures will be carried out and/or reviewed. These have been defined as:

- Short (1-2 years).
- Medium (2-5 years), i.e. within the lifetime of the strategy, and
- Long term (>5 years), to be carried forward for review in the next iteration of the strategy.

Table 6.1 Medway Council measures for local flood risk management

National Objectives	Local Objectives	Medway Council Measures	Responsible Organisation / Individual	Supporting Bodies	Funding Source	Timeframe for Implementation
1. Understand the risks	A. Medway Council will work with internal and external stakeholders to develop a collective understanding of local flood risk to enable successful local flood risk management.	i. Establish internal flood group. ii. Establish external flood group. iii. Establish processes for communication across flood working groups. Iiii Undertake Section 19 investigations on becoming aware of a flood event. v. Provide internal training to teams and individuals who can contribute towards flood risk management functions.	MC	EA, IDB, Southern Water	Defra grant	Short Term (< 2 years)
	B. Medway Council will monitor flood risk	i. Improved flood incident record collection to establish a record of flood incidents. ii. Establish a record of structures and features. iii. Undertake a Surface Water Management Plan.	MC	EA, IDB, Southern Water	Defra grant	Short Term (< 2 years) Short Term (< 2 years) Short / Medium Term
2. Prevent inappropriate development	A. Medway Council will ensure local planning policy is consistent with wider flood risk management policies and legislation at a national and regional level and provide clear advice on how to achieve those policies within Medway.	i. Undertake a review of current council policies relevant to flood risk management to ensure consistency with the most up to date plans and data. ii. Ensure that flood risk management infrastructure needs are taken account of in the Infrastructure Delivery Schedule that informs the Local Development Framework and Community Infrastructure Levy decisions.	MC	EA, IDB, Southern Water	Defra grant	Short Term (< 2 years) On-going
	B. Medway Council will promote the use of SuDS in accordance with it's forthcoming role as a SuDS Advisory Body and the forthcoming Defra National Standards	i. Establish a SuDS Approval Body within the council. ii. Develop local guidance for the adoption of SuDS within the Medway area to prepare for the forthcoming enactment of the SAB.	Defra, MC	Defra, EA		Dependant on Defra timescales, likely to be Short Term (< 2 years) Short Term (< 2 years)
	C. Medway Council will take account of the cumulative effects of developments and climate change on the risk of flooding throughout Medway	i. Develop a Supplementary Planning Document to address flood risk management from a planning context, with specific regard to the phased implementation of flood infrastructure in the area.	MC	EA		Medium Term (> 2 years but <5 years)
3. Manage the likelihood of flooding	A. Medway Council will require that all development have a positive or nil effect on the risk of flooding to and arising from proposed development.	i. Work with other RMA's via the planning process to achieve common goals to reduce flood risk.	MC	EA, IDB, Southern Water		On-going
	B. Medway Council will consider how future infrastructure improvements (e.g. highways, rail, public realm works) and/or changes could be used to deliver flood risk / surface water management benefits.	i. Design engineer to consider flood risk via consultation with flood risk officer, Highways Maintenance regime to consider flood risk ii. Identify opportunities to retrofit SuDS into existing developments.	MC	EA, IDB, SW		On-going
	C. Medway Council will use flood risk information to implement a risk-based approach to capital investment decisions and maintenance programmes and activities.	i. Use an Asset Register Management Database as a basis for informing risk based approach to capital investment decisions and maintenance programmes and activities led risk/conditions surveys against asset valuation.	MC			Short Term (< 2 years)

National Objectives	Local Objectives	Medway Council Measures	Responsible Organisation / Individual	Supporting Bodies	Funding Source	Timeframe for Implementation
	D. Medway Council will give consideration to the economical, social and environmental benefits and limitations of flood risk management measures when making investment decisions.	i. Use a benefit/cost options assessment method as the basis of determining investment decisions in flood risk management.				On-going
4. Help people manage their own risk	A. Medway Council will share information with respect to flood risk across Medway with all Risk Management Authorities and the public.	i. Web development to improve accessibility. ii. Consultation and engagement via external RMA flood group.	MC	EA, IDB, Southern Water	Defra Grant	Short Term (< 2 years)
	B. Medway Council will seek to increase public awareness (property owners, developers) with respect to flood risk and responsibility for flood risk management.	i. Engage with local communities regarding responsibilities for flood risk management (particularly land drainage consenting)	MC	EA, IDB, Southern Water	Defra Grant, Emergency Planning budget	Short Term (< 2 years)
5. Improve flood prediction, warning and post-flood recovery	A. Medway Council will use information on flood risk as a tool for flood prediction and warning.	i. Maintain flood risk and hazard mapping within the council	MC	EA	Defra Grant	Short Term (< 2 years)
	B. Medway Council will ensure that emergency plans and responses to flood incidents in Medway are effective	i. Review the current Medway Multi Agency Response Plan. Review and update where necessary call out engineers emergency operational procedures. Ensure that they both take account of latest data.	MC	EA	Defra Grant, Emergency planning budget	Short Term (< 2 years)
	C. Medway Council will ensure that communities understand the risks and their role and MC's role during an emergency	i. Consultation and engagement with the public to raise awareness of flood risk and local flooding issues and advise how they can reduce the consequences of flooding.	MC	EA	Defra Grant, Emergency planning budget	Short Term (< 2 years)

7. Funding Options

7.1 Overview

7.1.1 Part 1, Article 2, Section 9 Sub-section 4f of the FWMA states that the strategy must specify 'the costs and benefits of those measures, and how they are to be paid for'.

7.2 Costs and benefits

7.2.1 Structural measures required to meet objectives outlined in the strategy will be identified in the Medway SWMP. This will include a description of the approach adopted to assess these measures in terms of cost and benefit.

7.3 Funding

7.3.1 The effective practical implementation of flood risk management measures requires adequate resources both for the management and response activities of the LLFA as well as for capital projects. This section provides a summary of available forms of funding and seeks to assist with identifying any further actions that will be needed to ensure that particular funding alternatives are feasible.

7.3.2 Figure 7.1 identifies the various streams of funding open to RMAs which are discussed in turn in the following sections.

Funding to LLFA's through Area Based Grants

7.3.3 Funding for LLFA's to meet their new responsibilities has been allocated through Area Based Grants or local services support grants. The money is not ring fenced so individual LLFA's must decide how much of this grant to spend, subject to limits on overall budgets and the need for investment on other priorities.

7.3.4 The amount of money allocated to individual LLFAs varies based on the overall risk within the relevant area. This money has been made available to support Medway Council with its ongoing local flood risk management activities.

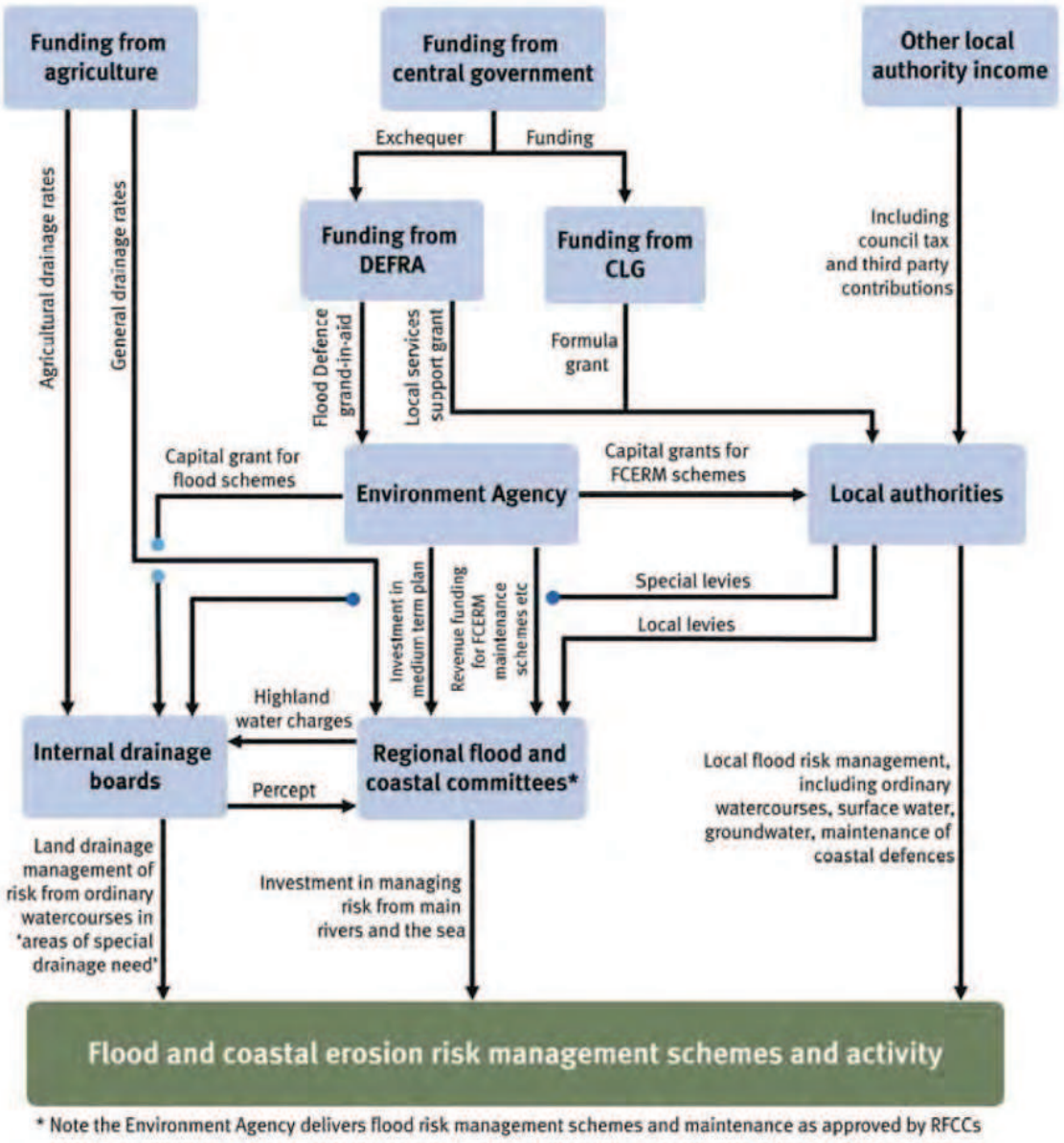

Figure 7.1 Funding Streams for Risk Management Authorities (Environment Agency, 2011)

Public Funding for Capital Schemes through 'Payment for Outcomes' and 'Flood Defence Grant in Aid' Schemes

7.3.5 The Pitt Review (Recommendation 24) recommended that the "Government should develop a scheme that allows and encourages local communities to invest in flood risk management measures". This recommendation is delivered by using the new 'Payment for Outcomes' approach, which came into force in April 2012. All schemes are now offered a fixed subsidy based on the benefits delivered when the outcomes are achieved with the aim to encourage communities to take more responsibility for the flood risk that they face. It also aims to deliver more benefit by encouraging total investment to increase beyond the levels that DEFRA alone

can afford. The new approach will see funding levels for each scheme provided by DEFRA through Flood Defence Grant in Aid (FDGIA) relating directly to benefits, in terms of the number of households protected, the damages being prevented plus other scheme benefits such as environmental benefits, amenity improvement, agricultural productivity and benefits to business. In addition to these elements, payment rates for protecting households in deprived areas will be higher so that schemes in these areas are more likely to be fully funded by the Government[19].

7.3.6 Under this system some schemes will receive complete funding if the benefits significantly outweigh the costs. For other schemes partial funding would be available. It is hoped that this approach would encourage people to find cheaper ways to achieve positive outcomes and/or find other funding mechanisms to pay the remaining cost of the scheme.

7.3.7 Figure 7.2 illustrates the 'Payment for Outcomes' approach and the importance of the local levy in fully funding flood defence and maintenance schemes.

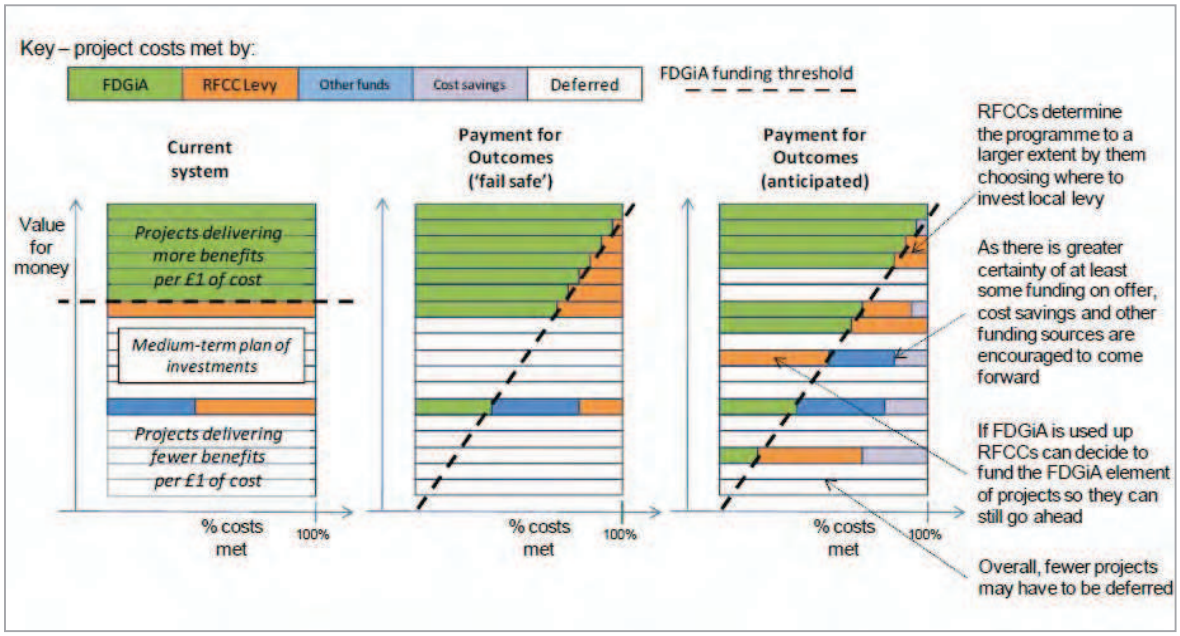

Figure 7.2 The Payment for Outcomes Approach and Importance of the Local Levy
Source: Defra Consultation Document (page 19)

Funding through the Community Infrastructure Levy

7.3.8 The Community Infrastructure Levy (CIL) came into force through the Community Infrastructure Regulations 2010 in April 2010 and provides LLFAs with an alternative source of potential funding for flood defence schemes. It allows local authorities to raise funds from new development in their area in order to pay for the impact that the development has on local

[19] For further information on how levels of depravation will be assessed, refer to the Index of Multiple Depravation commissioned by the Department for Communities and Local Government (www.imd.communities.gov.uk)

infrastructure. The levy is based on the concept that almost all development has some impact on infrastructure and services, so it is fair that development should contribute towards the cost of maintaining or upgrading local infrastructure.

7.3.9 The Community Infrastructure Levy must be levied in pounds per square metre of floor space arising from any chargeable development. The charge will be applied to the gross floor space of most new buildings or extensions to existing buildings.

7.3.10 Medway Council is in the process of undertaking work with a view to setting a charge for development within the area.

7.3.11 Local authorities are required to use this funding for infrastructure needed to support the development; it can be used to construct new infrastructure, increase the capacity of existing infrastructure or repair failing existing infrastructure. The Planning Act 2008 includes a broad definition of the infrastructure that can be covered by this scheme including transport, flood defences, schools, hospitals and parks.

Funding through the European Union

7.3.12 European Union funding is available through the 'Interreg' scheme from the European Regional Development Fund (ERDF).

Developer Contributions

7.3.13 Development may be liable for a charge under the Community Infrastructure Levy (CIL), as discussed in Section 7.3.8.

7.3.14 Section 106 of the Town and Country Planning Act 1990 allows an LPA to enter into an agreement with a landowner or developer in association with the granting of planning permission. A Section 106 agreement is used to address issues that are necessary to make a development acceptable, such as supporting the provision of services and infrastructure.

7.3.15 One of the recommendations of 'Making Space for Water' was that LPAs should make more use of Section 106 agreements to ensure that there is a strong planning policy to manage flood risk. This means that any flood risk, which is caused by, or increased by, new development, should be resolved and funded by the developer.

Local Fundraising

7.3.16 In addition to contributions from developers, another important funding mechanism will come from local fundraising from the local communities and businesses that stand to benefit from the proposed flood defence schemes. Fundraising may appear to be a daunting task but the best place to start is with those who stand to benefit from the project.

Other sources of funding

7.3.17 Defra is currently producing a good practice guide to support LPAs called 'Solutions for Joint Funding of Surface Water Schemes'. This project will explain the funding mechanisms and time cycles, approval processes of key partners and benefits of joint funding of local flood risk management.

8. Wider Environmental Objectives

8.1 Overview

8.1.1 Part 1, Article 2, Section 9 Sub-section 4i of the FWMA states that a local strategy must specify 'how the strategy contributes to the achievement of wider environmental objectives'.

8.1.2 In order to address this requirement, a review of relevant policy documents has been undertaken to identify environmental objectives of relevance to the study area. Subsequently, an assessment of which of Medway Council's flood risk management objectives (if any) contribute to each of these environmental objectives has been undertaken and justification provided. This process is presented in Table 8.1.

8.1.3 The European Directive 2001/42/EC was adopted in 2001 and transposed into English legislation by the Environment Assessment of Plans and Programmes Regulations in 2004. The purpose of the Directive is to increase the level of protection for the environment. It integrates environmental considerations into the preparation and adoption of plans and programmes with the view of promoting sustainable development.

8.1.4 The Directive requires a Strategic Environmental Assessment (SEA) to be carried out for all plans and programmes, which are subject to preparation and/or adoption, by an authority at national level, regional or local level. A SEA screening report has been undertaken to determine whether or not the contents of the strategy requires a SEA.

8.1.5 The screening exercise concludes that is it is unlikely that there will be any significant environmental effects arising from the objectives and measures included within the strategy and as such does not require a full SEA to be undertaken.

Table 8.1 Contribution of Medway Council flood risk management objectives to the achievement of wider environmental objectives

Source Document	Wider Environmental Objectives		Medway Council LFRMS Objectives												Comments
			1a	*1b*	*2a*	*2b*	*2c*	*3a*	*3b*	*3c*	*4a*	*4b*	*5a*	*5b*	
Regeneration, Communities and Culture Overview and Scrutiny Committee	*1*	Manage, protect, conserve and invest in our open spaces to create parks that can be enjoyed by all					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect open spaces from flood damage in the future; 3b. The use of non structural methods and/or SUDS can reduce the environmental impacts of flood risk measures, helping to conserve existing open spaces
	2	Reduce the carbon footprint and foster sustainable development in Medway			■				■						2a. The implementation of sustainable drainage techniques is a large part of wider policies such as the WFD and the FWMA and will help towards fostering sustainability in Medway; 3b. Sustainability goals could be reached by the use of SUDS that have both environmental and social benefits (e.g. Improved biodiversity and increased amenity etc) and also potential economic benefits (e.g. tourism)
Southern Water: Final Water Resources Management Plan	*3*	To protect and enhance terrestrial biodiversity including designated and other important habitats and species					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect important habitats from flood damage in the future; 3b. Flood risk management measures could both benefit and damage habitats/ecosystems. It is important that these factors are weighed up against each other to ensure the overall protection of the environment
	4	To protect and enhance aquatic biodiversity including designated and important habitats and species					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect important habitats from flood damage in the future; 3b. Flood risk management measures could both benefit and damage habitats/ecosystems. It is important that these factors are weighed up against each other to ensure the overall protection of the environment
	5	To minimise negative effects on local communities resulting from construction and operation of options					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect local communities from flood damage in the future; 3b. Detrimental social effects of a flood management strategy should be considered before any development is implemented. It should be noted that economic and environmental impacts are likely to have social impacts on the community as well
	6	To protect and enhance geological and geomorphologic diversity							■						3b. Flood risk management measures could both benefit and damage habitats/ecosystems. It is important that these factors are weighed up against each other to ensure the overall protection of the environment
	7	To maintain and enhance landscape character					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect landscape character from flood damage in the future; 3b. Flood risk management measures could both benefit and damage landscape character. It is important that these factors are weighed up against each other to ensure the overall protection of the environment
	8	To maintain and enhance salmonid and freshwater fisheries					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect fisheries from flood damage in the future; 3b. The safeguarding of fisheries through flood management is important to maintain local economic activity as well as reducing environmental impacts related to over fishing of other areas. Damage to fisheries resulting in economic losses would also have a social impact
	9	To reduce contamination and safeguard soil quality and quantity							■						3b. Consideration must be given to the environmental (and economic in agricultural areas) impacts on soil quality to ensure any proposed flood mitigation measures do not contribute to contamination or other negative soil properties.
	10	To protect and enhance groundwater quantity and quality							■						3b. Consideration must be given to the environmental and economic impacts on groundwater sources to ensure any proposed flood mitigation measures do not contribute negatively to water quality and quantity.
	11	To protect and enhance coastal water quality							■						3b. Consideration must be given to the environmental, social and economic impacts on coastal waters to ensure any proposed flood mitigation measures do not contribute negatively to water quality.
	12	To protect and enhance transitional surface water flows and quality							■						3b. Consideration must be given to the environmental, social and economic impacts on transitional surface waters to ensure any proposed flood mitigation measures do not contribute negatively to water quality.
	13	To protect and enhance surface water flows and quality							■						3b. Consideration must be given to the environmental, social and economic impacts on surface waters to ensure any proposed flood mitigation measures do not contribute negatively to water quality.

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Source Document		Wider Environmental Objectives	Medway Council LFRMS Objectives												Comments
			1a	*1b*	*2a*	*2b*	*2c*	*3a*	*3b*	*3c*	*4a*	*4b*	*5a*	*5b*	
	14	To minimise the risk of flooding taking account of climate change	■	■	■		■		■	■					1a. To be able to minimise the risk of flooding, it is first necessary to fully understand this risk so that it can be planned for and managed effectively; 1b. Climate change will increase the likelihood of flood events and must be considered when devising management strategies; 2a. A reduction in flood risk is a part of a number of wider policies (RBMPs, SMPs, RFRAs etc). Flood risk strategies should be consistent across all policies to ensure efficient risk management; 2c. Any development must not increase flood risk. In the case of flood risk management developments, they must not just simply transfer risk to other areas; 3b. The council must consider the environmental impacts of any flood risk measures and also any economic losses related to flooding if no management strategy is implemented; 3c. Development of infrastructure to double up as flood management features could mean reduction in flood risk could be achieved efficiently
	15	To maintain and enhance local air quality							■						3b. Flood mitigation measures that enhance green areas such as SUDS could help to maintain local air quality as a by-product
	16	To reduce greenhouse gas emissions							■						3b. Flood mitigation measures that enhance green areas such as SUDS could help to reduce or offset greenhouse gas emissions in Medway
	17	To reduce the generation of waste and encourage re-use and recycling of waste and use sustainably produced and local products							■						3b. Efficient use of raw materials in the implementation of flood management measures will have environmental benefits by reducing waste going to landfill. There is also potential for using recycled and/or locally sourced materials
	18	To protect and enhance sites and features of archaeological, historical and architectural interest					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect archaeological and historic features from flood damage in the future; 3b. Consideration must be given to the social and economic impacts on archaeological or historic features to ensure any proposed flood mitigation measures do not contribute negatively towards their preservation.
	19	To minimise adverse effects to other abstractors, rights of navigation and other commercial users of water bodies	■				■		■						1a. Cooperation with all stakeholders on flood risk management will help to minimise negative impacts upon all relevant parties 2c. Ensuring that new development does not increase current flood risk will help to minimise effects to other water users from flood damage in the future; 3b. Consideration should be given to the social and economic impacts that flood mitigation measures may have on other water users.
Medway Strategic Flood Risk Assessment	***20***	Quantity: minimise impermeable surfaces by good planning of development layout					■		■	■					2c. Positive effects on flooding can be achieved by reducing areas of impermeable surfaces to minimise runoff; 3b. Permeable surfaces allow for increased groundwater recharge and improve water quality by filtration resulting in reduced treatment costs. Permeable surfaces also reduce runoff that can wash pollutants from urban surfaces into watercourses; 3c. Future infrastructure improvements could be designed to incorporate permeable surfaces that can be used in place of non permeable materials such as paving in car parks etc to improve infiltration capacity and thus improve flood attenuation capabilities
	21	Quantity: control at source to reduce extra runoff					■		■	■					2c. New or re-developments can be designed to have more control over excess runoff so that overall flood risk decreases (or at least does not increase); 3b. Environmental benefits are offered by reduced runoff such as decreased erosion as well as less potential for pollutants to be washed into watercourses; 3c. Infrastructure can be designed specifically to incorporate ways of attenuating flows such as increasing infiltration or temporary storage
	22	Quantity: limit peak discharge to an agreed allowable runoff rate					■		■	■					2c. New or re-developments can be designed to have more control over excess runoff so that overall flood risk decreases (or at least does not increase); 3b. Environmental benefits are offered by reduced runoff such as decreased erosion as well as less potential for pollutants to be washed into watercourses; 3c. Infrastructure can be designed specifically to incorporate ways of attenuating flows such as increasing infiltration or temporary storage
	23	Quantity: attenuate excess water to an agreed storm return period (normally 1 in 100 year with allowances for climate change)		■			■		■	■					1b. Allowing for climate change ensures that any flood mitigation measures are sufficient for predicted future scenarios; 2c. New or re-developments can be designed to have more control over excess runoff so that overall flood risk decreases (or at least does not increase); 3b. Environmental benefits are offered by reduced runoff such as decreased erosion as well as less potential for pollutants to be washed into watercourses; 3c. Infrastructure can be designed specifically to incorporate ways of attenuating flows such as increasing infiltration or temporary storage

Source Document		Wider Environmental Objectives	Medway Council LFRMS Objectives												Comments
			1a	*1b*	*2a*	*2b*	*2c*	*3a*	*3b*	*3c*	*4a*	*4b*	*5a*	*5b*	
	24	Quantity: low flow routes for frequent storms and first part of volume of rare storms through treatment stage				■	■		■	■					2b. Flow routes are rarely confined to a single development site and therefore need to be examined across a larger area; 2c. New or re-developments can be designed to have more control over runoff so that overall flood risk decreases (or at least does not increase); 3b. Environmental benefits are offered by reduced runoff such as decreased erosion as well as less potential for pollutants to be washed into watercourses; 3c. Infrastructure can be designed specifically to incorporate ways of routing flows away from important areas or features
	25	Quantity: high flow routes for extreme events with overland flood routes				■	■		■	■					2b. Flow routes are rarely confined to a single development site and therefore need to be examined across a larger area; 2c. New or re-developments can be designed to have more control over excess runoff so that overall flood risk decreases (or at least does not increase); 3b. Environmental benefits are offered by reduced runoff such as decreased erosion as well as less potential for pollutants to be washed into watercourses; 3c. Infrastructure can be designed specifically to incorporate ways of routing flows away from important areas or features
	26	Quality: prevent pollution by good planning of development layout and site management							■						3b. Flood mitigation measures that reduce pollution (such as SUDS) will have obvious environmental benefits. There is also potential for economic gains as water treatment does not need to be as rigorous
	27	Quality: treatment stages, usually a minimum of one for housing													
	28	Quality: appropriate technique to treat runoff from roads and pavements							■						3b. Flood mitigation measures such as SUDS that can be used to treat runoff will have obvious environmental benefits. There is also potential for economic gains as water treatment does not need to be as rigorous
	29	Quality: 'source control' preferred to control silt and pollution							■						3b. Consideration should be given to certain flood mitigation measures that are designed to offer environmental benefits by filtering the water of silt and pollutants to improve water quality. There is also potential for economic gains as water treatment does not need to be as rigorous
	30	Quality: 'first flush' treatment for all roads and pavements							■						3b. Consideration should be given to flood mitigation measures that are designed to offer environmental benefits by isolating the first flush from cleaner runoff which will help to reduce the majority of pollutants reaching watercourses untreated
	31	Amenity: Techniques should maximise opportunities for amenity including environmental and bio-diversity where possible							■						3b. Flood mitigation measures can be used to increase the amenity value of land and thus have social and environmental benefits (as well as potential economic benefits)
	32	Amenity: Techniques should protect amenity							■						3b. Consideration should be given to those flood mitigation measures that can be used in tandem with existing amenity features without having to remove them, therefore avoiding a loss of amenity that could lead to social, environmental and economic losses
Sustainable Community Strategy 2010-26	*33*	Medway to have a safe and high quality environment by 2026							■						3b. Consideration should be given to those flood mitigation measures that can have beneficial environment and social impacts by increasing biodiversity and amenity
	34	Increase user access through promoting the Hoo Peninsula and North Kent Marshes as a sustainable tourism initiative							■						3b. Consideration should be given to those flood mitigation measures that are able to increase amenity and environmental value of the area. This will help to attract tourism which in turn, will have economic benefits
	35	Increase user access through promoting greater awareness of the Medway and Thames estuary resources							■						3b. Social benefits derived from flood risk managements schemes (e.g. Improved amenity) can help to improve user access which should in turn help to raise awareness of the area
Medway Estuary and Swale Shoreline Management Plan	*36*	Prevent degradation of landscape quality and visual amenity from flooding and flood risk management works					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect landscapes from flood damage in the future; 3b. Consideration should be given to potential environmental and economic losses that could occur from degradation of the landscape as well as social impacts from a loss of amenity as a result of any proposed flood management strategies.
	37	Promote biodiversity opportunities and prevent loss/damage to habitats and associated species at various SSSIs, SNCIs, SPAs and UK BAP priority habitats from flooding and flood risk management works.					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect important habitats and conservation sites from flood damage in the future; 3b. Consideration should be given to those flood mitigation measures that can offer environmental benefits (e.g. enhanced biodiversity through improved water quality etc) while also protecting the fragile habitats from flood events. Any potential negative impacts of a flood mitigation scheme also need to be considered in the planning stages

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Source Document		Wider Environmental Objectives	Medway Council LFRMS Objectives												Comments
			1a	1b	2a	2b	2c	3a	3b	3c	4a	4b	5a	5b	
	38	Promote biodiversity opportunities and avoid net loss of coastal grazing marshes and intertidal habitat and associated species from coastal squeeze and flood risk management works.					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect important habitats from flood damage in the future; 3b. Consideration should be given to those flood mitigation measures that can offer environmental benefits (e.g. enhanced biodiversity through improved water quality etc) while also protecting the fragile habitats from flood events. Any potential negative impacts of a flood mitigation scheme also need to be considered in the planning stages
	39	Prevent loss/damage to heritage from flooding and flood risk management works or implement appropriate mitigation measures, including preservation of evidence by record. Seek opportunities to enhance features where appropriate					■		■						2c. Ensuring that new development does not increase current flood risk will help to protect heritage sites and features from flood damage in the future; 3b. Consideration should be given to the social and economic impacts on heritage sites to ensure any proposed flood mitigation measures do not contribute negatively towards their preservation.
	40	Prevent loss/damage to Conservation Areas and SAMs from flooding and flood risk management works. Seek opportunities to enhance features where appropriate.					■		■						2c. Ensuring that new development does not increase current flood risk will help to prevent damage to conservation areas and SAMs in the future; 3b. Consideration should be given to the environmental, social and economic impacts on conservation and SAM sites to ensure any proposed flood mitigation measures do not contribute negatively towards their preservation.
	41	Prevent loss/damage to shell fishery at Queensborough from flooding or flood risk management works.					■		■						2c. Ensuring that new development does not increase current flood risk will help to prevent damage to the fishery in the future; 3b. Consideration should be given to the environmental, social and economic impacts of flood defences on the shell fishery. Negative impacts (e.g. cost to protect the fishery from floods) should be weighed up against positive impacts such as avoiding the need for over fishing in other areas and economic and social gains from employment opportunities
	42	Prevent loss/damage/disruption to recreation and associated business from flooding and flood risk management works.					■		■						2c. Ensuring that new development does not increase current flood risk will help to prevent damage to recreation facilities in the future; 3b. Consideration should be given to the environmental, social and economic impacts of flood defences on recreation and associated businesses. Negative impacts (e.g. cost to protect recreation sites from floods) should be weighed up against positive impacts such as economic and social gains from maintaining access to recreation facilities
Medway Flood Defence Strategy: High Level Appraisal of Potential Solutions to Manage Flood Risk in the Urban Medway	43	To effectively realise Medway's role within the Thames Gateway and associated growth requirements primarily through effective physical regeneration, the reuse of previously developed land and the protection and enhancement of the area's many natural and heritage assets.				■			■						2b. Flood risk management strategies that are able to offer benefits across regeneration areas rather than just individual sites will help to achieve Medway's goal of effective physical regeneration; 3b. Consideration should be given to the use of brownfield sites for flood mitigation measures, which will benefit the environment by reducing the need for development of Greenfield sites as well as aiding the physical regeneration of the area. Flood risk management strategy may also make it possible to develop sites that were previously non viable development options due to flood risk, helping to meet growth requirements
	44	To develop Chatham as a city centre of regional significance with its role complemented by thriving and attractive traditional town centres in Strood, Rochester, Gillingham and Rainham together with a network of strong neighbourhood centres serving local communities.							■						3b. Consideration should be given to those flood mitigation measures that have the potential to improve local amenity, resulting in both social and economic benefits and thus helping Chatham and surrounding towns to develop. There may also be opportunities for environmental benefits depending on measures implemented
	45	To radically improve the quality of the townscape and public realm within the central urban area and along the urban waterfront.							■						3b. Consideration should be given to those flood mitigation measures that have the potential to improve local amenity, resulting in both social and economic benefits and thus helping to enhance the townscape. There may also be opportunities for environmental benefits depending on measures implemented
	46	To enhance the quality of life of local people through the promotion of healthier lifestyles and the provision of improved cultural, leisure and tourism facilities, including along the river Medway.							■						3b. Consideration should be given to the provision of green space by the use of SUDS as a flood mitigation measure, which would benefit local amenity and the environment, making outdoor space more attractive and therefore helping to promote healthier, more active lifestyles. It could also attract economic benefits from increased tourism

Source Document		Wider Environmental Objectives	Medway Council LFRMS Objectives												Comments
			1a	*1b*	*2a*	*2b*	*2c*	*3a*	*3b*	*3c*	*4a*	*4b*	*5a*	*5b*	
Environment and Front Line Services Overview and Scrutiny Committee	*47*	To ensure prudent use of land and other resources.							■						3b. Consideration should be given to the impacts of flood mitigation strategies upon land usage. Where possible, non-structural methods (e.g. improved planning and forecasting etc) should be implemented to reach flood management targets without the need for construction. Where structural measures are required, SUDS could be used to control flooding while maintaining the green nature of the land. They also require minimal raw materials in comparison to 'harder' more engineered techniques
	48	To reduce greenhouse gas emissions.		■					■						1a. Certain flood mitigation measures will have varying effects on the volumes of greenhouse gases produced (mainly from the construction phase) and as such, varying contributions towards climate change. This should be considered when producing a flood management policy; 3b. Climate change has a marked effect on the environment and any contributions to greenhouse gases from flood management schemes should be considered before implementation
	49	To minimise air quality impacts.							■						3b. The implementation of SUDS over 'harder' flood mitigation methods could help to maintain levels of green space in the area that would contribute towards improved air quality
	50	To conserve landscapes and townscapes.					■		■						2c. Ensuring that new development does not increase current flood risk will ensure that land/townscapes will remain protected in the future; 3b. Flood management measures can help to protect town and landscapes from flood damage and at the same time add extra social and environmental benefits by improving amenity and green space. Non-structural methods that do not impact on the land/townscape should also be considered (however this maybe a missed opportunity to make improvements rather than just avoiding degradation).
	51	To protect local amenity.	■				■		■						1a. Cooperation with all stakeholders will help to assess the views of what contributes to local amenity so that it can be effectively protected; 2c. Ensuring that new development does not increase current flood risk will ensure that amenity sites in Medway will remain protected in the future; 3b. Flood mitigation measures can be used to maintain the green nature of areas that add amenity value. Using the correct measures can not only protect local amenity but may also be able to improve it
	52	To minimise adverse effects on water quality.							■						3b. The use of SUDS can lead to environmental benefits from improved water quality by acting as a filtration treatment stage. This also has an economic benefit as water will not require as much treatment by water companies
	53	To minimise local transport impacts.							■	■					3b. Flood mitigation measures can be used to protect transport infrastructure leading to economic benefits derived from less damage and also from a reduction in loss of economic activity from people unable to travel due to flood waters; 3c. Reducing flood effects on transport networks could be realised by implementing flood measures as part of general infrastructure improvements works that could also benefit the wider area
	54	To provide employment opportunities.							■						3b. Social benefits could be derived from the creation of employment opportunities in the process of designing, constructing and maintaining flood mitigation measures
	55	To provide opportunities for public involvement / education.	■						■		■	■			1a. Engaging with all stakeholders including the public is key to ensuring the flood risk situation in the area is fully understood which is vital when designing a management strategy; 3b. During the planning stages, consultation with the public should be offered to help to assess the social impacts of flood management schemes on residents as well as any economic impacts to local businesses; 4a. Sharing of information between the council and the public is important for ensuring that the public feel involved and fully understand the proposals so that consultation is effective and efficient; 4b. Increasing public awareness of flood risk will help to educate the public so that they can take steps to better protect themselves in the event of a flood
	56	To minimise costs of waste management.													
	57	To ensure reliability of delivery.													
	58	To conform with waste policy.													

9. Review and Update

9.1 Overview

9.1.1 Part 1, Article 2, Section 9 Sub-section 4h of the FWMA requires LLFA to specify 'how and when the strategy will be reviewed' and where considered appropriate update their identified objectives and measures for flood risk management on a regular basis.

9.1.2 It is proposed that at a minimum, a review of the strategy should take place every six years to coincide with the requirement under the FRR 2009 to revise the PFRA and flood risk and hazard maps.

9.1.3 As a result of recent legislation and new roles and responsibilities of LLFA's, there are likely to be many changes to the way flood risk is managed. The strategy should be viewed as a dynamic strategy and some updates may need to be produced to recognise those changes.

9.1.4 Potential triggers include:

- Occurrence of a significant and widespread surface water flood event.
- Additional data or modelling becoming available which may alter the understanding of risk within the study area.
- If the outcome of investment decisions by partners is different to the preferred option which may require a revision to the action plan.

9.1.5 To complement the strategy, annual action plans will be produced in conjunction with other Risk Management Authorities and will include;

- A report of any changes and amendments deemed necessary
- An overview of the newest information available about local flood risk.
- Actions required to satisfy legislation within the forthcoming year
- Actions from Surface Water Management Plans
- Other flood risk management activities, which will be undertaken by Medway Risk Management Authorities in the current year.

9.1.6 The annual action plans will ensure that operations are joined up across the Risk Management Authorities and to ensure that decisions on resources are evidence based.

10. Further Reading and Information

10.1 The Environment Agency National Strategy

10.1.1 Understanding the risks, empowering communities, building resilience - The national flood and coastal risk management strategy for England is provided by the Environment Agency. It describes what needs to be done by all the risk management authorities to reduce the risk of flooding and coastal erosion, and to manage its consequences.

www.official-documents.gov.uk/document/other/9780108510366/9780108510366.asp

10.2 Environment Agency Area Flood Risk Management Strategies

10.2.1 The Environment Agency website contains details of Flood and Coastal Erosion Risk Management (FCERM) activities across the UK

10.2.2 View FCERM activity in your area:

www.environment-agency.gov.uk/homeandleisure/floods/31736.aspx

10.3 Future Funding of flood and Coastal Erosion Risk Management in England (Defra)

10.3.1 Visit Defra's website for more detailed information about the changes to funding:

www.defra.gov.uk/environment/flooding/funding-outcomes-insurance/

https://www.gov.uk/government/policies/reducing-the-threats-of-flooding-and-coastal-change

10.4 The Pitt Review

10.4.1 This review of the 2007 floods by Sir Michael Pitt identified the lessons learned, focusing on the needs of people living and working in areas at risk. The review made 92 recommendations, focusing on six key aspects of flood risk management and has also led to a greater focus on surface water

flooding - a main cause of damage in the 2007 floods.

http://webarchive.nationalarchives.gov.uk/20100807034701/http:/archive.cabinetoffice.gov.uk/pittreview/thepittreview/final_report.html

10.5 Flooding in England

10.5.1 The Environment Agency's national assessment of flood risk for England sets out the current level of risk from rivers and the sea and what the Environment Agency is doing to manage it. Available to view or download from the Environment Agency website:

www.environment-agency.gov.uk/research/library/publications/108660.aspx

10.6 Investing for the future - Flood and coastal risk management in England

10.6.1 This report outlines the Environment Agency's long-term investment strategy for flood and coastal risk management. The latest climate change predictions indicate that flooding and coastal erosion are likely to increase in the future. The long-term investment strategy sets out the scale of the investment needed to meet this challenge over the next 25 years. Available to view or download from the Environment Agency website:

www.environment-agency.gov.uk/research/library/publications/108673.aspx

10.7 The Foresight Future Flooding Report

10.7.1 Foresight projects are in-depth studies commissioned by the Department for Business, Innovation and Skills, which look at major issues 20-80 years into the future. The Future Flooding Report was produced by the Flood and Coastal Defence project of the foresight programme. The report identifies the drivers of future flood risk and outlines how climate change will affect us in 30 to 100 years' time. The report is available to view or download from the Department for Business, Innovation and Skills website:

http://www.bis.gov.uk/foresight/our-work/projects/published-projects/flood-and-coastal-defence/project-outputs/volume-1

10.8 National Flood Forum

10.8.1 The National Flood Forum is a national charity dedicated to supporting and representing communities and individuals at risk of flooding. They provide information to enable communities to prepare for and deal with issues they face when flooding occurs. It brings together individuals and communities with those responsible for managing flood risk. It also provides learning and training programmes to agencies, authorities and communities, and highlights flood risk issues to government.

10.8.2 Visit the National Flood Forum website *www.floodforum.org.uk*

11. References

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Cabinet Office (2008) Pitt Review - Learning Lessons from the 2007 Floods

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Environment Agency (2007) Living on the edge – a guide to the rights and responsibilities of riverside occupation. 3rd Edition.

Flood Hazard Research Centre (2010) Multi-Coloured Manual

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HMSO and the Queen's Printer of Acts of Parliament (2010) Flood and Water Management Act http://www.legislation.gov.uk/ukpga/2010/29/pdfs/ukpga_20100029_en.pdf [accessed 27/7/12]

HMSO and the Queen's Printer of Acts of Parliament (2009) The Flood Risk Regulations http://www.legislation.gov.uk/uksi/2009/3042/pdfs/uksi_20093042_en.pdf [accessed 27/7/12]

Medway Council (September 2011) Preliminary Flood Risk Assessment

Mott MacDonald (August 2006) Medway Council Strategic Flood Risk Assessment (SFRA)

Scott Wilson (February 2011) Medway Council Strategic Flood Risk Assessment (SFRA) Addendum

UK Roads Liaison Group (UKRLG) Code of Practice for Highways Maintenance

HMSO and the Queen's Printer of Acts of Parliament (1991) Land Drainage Act

HMSO and the Queen's Printer of Acts of Parliament (2004) Civil Contingencies Act

Water Research Centre (WRC), 2006, Sewers for Adoption (6th Edition)

Glossary

Annual Exceedance Probability (AEP)

The average probability of a rainfall event occurring in any given year.

Catchment Flood Management Plan

A high-level planning strategy through which the EA works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.

Civil Contingencies Act

This Act delivers a single framework for civil protection in the UK. As part of the Act, Local Resilience Forums must put into place emergency plans for a range of circumstances including flooding.

Climate Change

When included as part of a flood event return period scenario, it means that that scenario includes the anticipated affects of climate change. For rainfall events, it incorporates a 30% increase. These climate change values are based upon information within the NPPF and PPS25 Practice Guide.

FCERM

Flood and Coastal Erosion Risk Management

Flood and Water Management Act (FWMA)

Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.

Flood Hazard

The derivation of flood hazard is based on the methodology in Flood Risks to people FD2320 using and is a function of flood depth, flow velocity and a debris factor.

Flood Map for Surface Water (FMfSW)

National surface water flood risk mapping published by the EA. This dataset provides an indication of the broad areas likely to be at risk of surface water flooding during the 0.5% and 3.3% AEP rainfall events.

Flood Risk Regulations 2009 (FRR 2009)

Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.

IDB

Internal Drainage Board

Lead Local Flood Authority (LLFA)

Lead Local Flood Authority in relation to an area in England means the unitary authority for the area, or if there is no unitary authority, the county council for the area (as defined by the FWMA).

LiDAR

Light Detection and Ranging data is obtained from an airborne survey technique that uses a laser to measure the distance between an aircraft and the ground surface.

Local Flood Risk Management Strategy (LFRMS)

A strategy for the management of local flood risk (that from surface water, groundwater and ordinary watercourses), to be developed, maintained, applied and monitored by the LLFA, as a duty under the FWMA.

Local Resilience Forum

A multi-agency forum, bringing together all the organisations that have a duty to cooperate under the Civil Contingencies Act, and those involved in responding to emergencies. They prepare emergency plans in a co-ordinated manner.

National Receptor Database (NRD)

A collection of risk receptors produced by the EA.

Ordinary Watercourse

All watercourses that are not designated Main River, and which are the responsibility of Local Authorities or, where they exist, IDBs

Ordnance Survey Master Map (OSMM)

OS Master Map is highly detailed mapping including individual buildings, roads and areas of land according to land use categories. The data is presented in GIS as polygon and line data.

Pitt Review

Comprehensive independent review of the 2007 summer floods by Sir Michael Pitt, which provided recommendations to improve flood risk management in England.

Pluvial modelling

Flooding from water flowing over the surface of the ground; often occurs when the soil is saturated and natural drainage channels or artificial drainage systems have insufficient capacity to cope with additional flow.

Preliminary Flood Risk Assessment (PFRA)

A report required under the FRR 2009 for each LLFA administrative area, detailing information on past and future (potential) floods, and identifying Flood Risk Areas. LLFAs are only required to undertake a PFRA for local sources of flooding, which principally includes surface water, groundwater and ordinary watercourses.

Risk Management Authority (RMA)

Organisation that has a key role in flood and coastal erosion risk management as defined by the Flood and Water Management Act 2010. These include the EA, lead local flood authorities, district councils where there is no unitary authority, internal drainage boards, water companies and highways authorities.

Regional Flood and Coastal Committee (RFCC)

Established by the EA under the FWMA and takes the place of the Southern Regional Flood Defence Committee (RFDC). It brings together members appointed by LLFAs and independent members with relevant experience for the purpose of effective flood risk management.

Risk

In flood risk management, risk is defined as a product of the probability or likelihood of a flood occurring, and the consequence of the flood.

SEA

Strategic Environmental Assessment

Stakeholder

A person or organisation affected by the problem or solution, or interested in the problem or solution. They can be individuals or organisations, includes the public and communities.

Surface Water

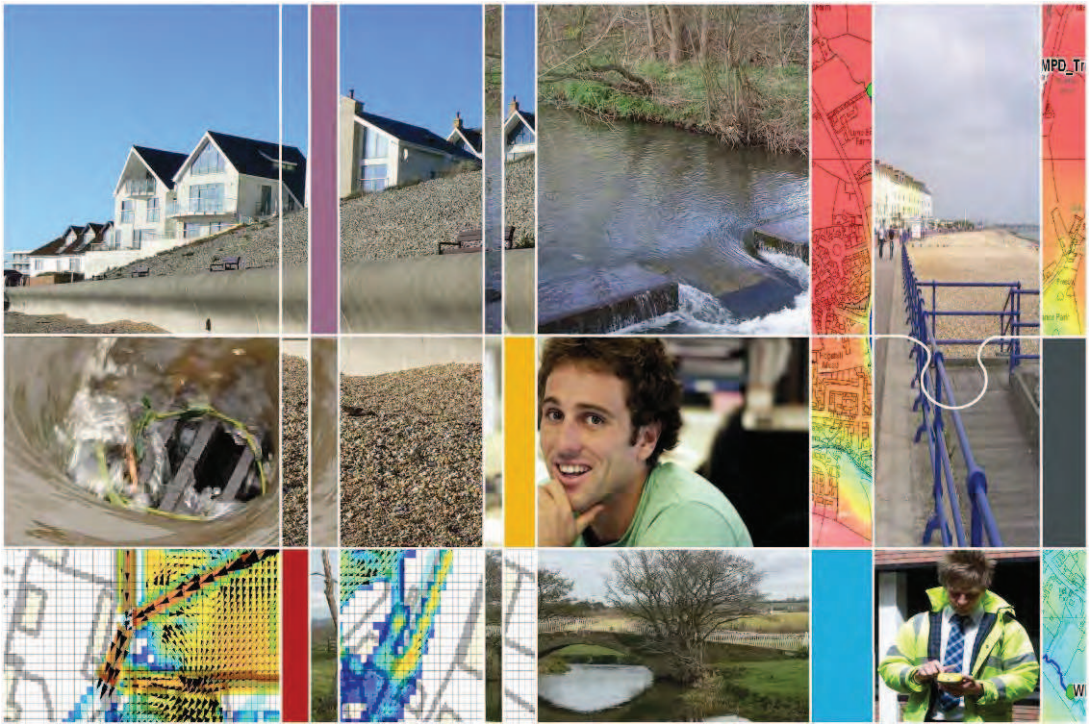
Rainwater (including snow and other precipitation), which is on the surface of the ground (whether or not it is moving), and has not entered a watercourse, drainage system or public sewer.

TuFLOW

TuFLOW is a modelling package for simulating depth averaged 2D free-surface flows and is in widespread use in the UK and elsewhere for 2D inundation modelling.

Appendix 1 – Pluvial Modelling Methodology

Commission reference: LA020



Medway Council Local Flood Risk Management Strategy

Technical Appendix 1: Pluvial Modelling Methodology (Final Report)

October 2013

CAPITA SYMONDS | URS
Flood Risk Management

Document overview

Capita Symonds with URS Infrastructure and Environment UK Ltd was commissioned by Medway Council in the preparation of their Local Flood Risk Management Strategy as required under the Flood and Water Management Act 2010.
This report details the methodology for the pluvial modelling carried out as part of this study.

Document history

Version	Status	Issue date	Prepared by	Reviewed by	Approved by
1	Draft	Aug 2012	Edward Byers Graduate Consultant Sarah Littlewood Assistant Consultant	Stephen Riley Principal Consultant Jon Robinson Technical Director	Jon Robinson Technical Director Scott Ferguson Technical Director
2	Final Draft	October 2013	Emily Craven Principal Consultant Edward Byers Assistant Consultant	Tom Edward Senior Consultant	Jon Robinson Technical Director

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1. Introduction

1.1 Project background

1.1.1 The Flood and Water Management Act[1] (FWMA) designates Medway Council as a Lead Local Flood Authority (LLFA) and requires Medway Council to develop, maintain and apply a Local Flood Risk Management Strategy (LFRMS) ("the Strategy") for its administrative area. Over time, Medway Council will use this Strategy to increase their understanding of local flooding issues (from surface water, groundwater and ordinary watercourses), and improve the management of local flood risk. Therefore, in order to inform the Strategy, it is necessary for Medway Council to undertake an assessment of the level of flood risk across the Council's administrative area.

1.1.2 In addition to this duty under the FWMA, one of the requirements of the Flood Risk Regulations 20092 (FRR 2009) is the preparation of flood risk and flood hazard maps for relevant sources of flooding by December 2013.

1.1.3 In light of these two requirements, direct rainfall modelling using TuFLOW software has been undertaken across the Council's administrative area in order to gain an improved understanding of the risk of flooding resulting from heavy rainfall and overland flow. This is also referred to as pluvial flooding.

1.1.4 This document provides a record of the approach and methodology that has been adopted for the pluvial modelling across Medway Council's administrative area. As such it forms a supporting document to Medway Council's LFRMS[3].

1.2 Study objectives

1.2.1 The aim of pluvial modelling is to determine the risk of pluvial flooding across the Council's administrative area. This will be achieved through the following objectives:

1) Apply rainfall events of known probability directly to the ground surface to provide an indication of potential flow path directions and velocities and areas where surface water will pond;

2) Undertake verification of pluvial modelling results based on historic flood records held by the Council, site visits and local knowledge;

[1] HMSO and the Queen's Printer of Acts of Parliament (2010) Flood and Water Management Act
[2] HMSO and the Queen's Printer of Acts of Parliament (2009) Flood Risk Regulations
[3] Capita Symonds / URS (August 2012) Medway Council Local Flood Risk Management Strategy (DRAFT)

3) Undertake sensitivity analysis to provide an indication of the level of confidence that can be placed in the model results;

4) Prepare maps to show the maximum flood depths for each modelled return period;

5) Prepare maps to show the corresponding flood hazard ratings (a function of both the depth and velocity of floodwater) for each modelled return period.

1.3 Previous studies

Environment Agency Flood Map for Surface Water

1.3.1 The Environment Agency (EA) have undertaken national surface water flood risk mapping and prepared the Flood Map for Surface Water (FMfSW) dataset. This dataset provides an indication of the broad areas likely to be at risk of surface water flooding during the 0.5% Annual Exceedance Probability (AEP) event and the 3.3% AEP event. For each event, the FMfSW identifies those areas that experience flooding greater than 0.1m, and those areas modelled to experience flooding of greater than 0.3m.

1.3.2 The TuFLOW pluvial modelling undertaken to support the LFRMS for Medway Council will build upon this the FMfSW national modelling and seeks to provide a model with an improved level of accuracy with assumptions based on the local conditions rather than national assumptions.

Medway Council Preliminary Flood Risk Assessment

1.3.3 In accordance with the requirements of the FRR 2009, Medway Council prepared a Preliminary Flood Risk Assessment[4] (PFRA) for their administrative area in 2011. The PFRA contains information regarding past and future (potential) floods from local sources of flooding, which principally includes surface water, groundwater and ordinary watercourses. Historic flood records held by the Council as well as those included within the PFRA report will be used to verify the pluvial modelling results.

[4] Medway Council (2011) Preliminary Flood Risk Assessment Report

2. Model Build and Simulation

2.1 Modelling approach (choice of software)

2.1.1 TuFLOW software has been used to undertake the modelling assessment. TuFLOW is a modelling package for simulating depth averaged 2D free-surface flows and is in widespread use in the UK and elsewhere for direct rainfall modelling. All models have been run using TuFLOW build 2011-09-AF-iDP-w64.

2.1.2 Using this approach and software, rainfall events of known probability are applied directly to the ground surface and are routed overland to provide an indication of potential flow path directions and velocities and areas where surface water will pond.

2.2 Catchment characteristics and model extents

2.2.1 Medway is located in Kent, to the south of the Thames Estuary. The River Medway divides the administrative area in half, with the northern half comprising predominantly low lying rural marshland and scattered villages and the southern portion populated by the larger towns of Rochester, Chatham and Gillingham.

2.2.2 Due to the size of the study area (260km^2) it has not been possible to construct one model for the entire study area and retain a reasonable model resolution. As a result, five individual hydraulic models have been constructed to cover the administrative area of Medway Council. The extent of each of the models is based upon the natural catchments within Medway. Figure A.1 shows the boundaries of the models covering the Borough of Medway, along with the name of the model.

2.3 Model grid size

2.3.1 The five pluvial models have been constructed with a 5m grid size. This grid size was chosen as it represented a good balance between the degree of accuracy (i.e. ability to model overland flow paths along roads or around buildings) whilst maintaining reasonable model run ("simulation") times. For example, refining the grid size from a 5m grid to a 2m grid is likely to increase each model simulation time from 30 hours to approximately 11 days.

2.4 Topographic representation

2.4.1 Light Detecting and Ranging Data (LiDAR) was used as the base information for the model topography across the majority of the study area. LiDAR data is an airborne survey technique that uses a laser to measure the distance between an aircraft and the ground surface.

2.4.2 The EA LiDAR data covering the majority of the study area from their archive dataset that contains digital elevation data derived from surveys carried out since 1998. Some of the coverage has a resolution of 1m and the remainder, primarily to the north-west of the River Medway, 2m, and the vertical accuracy is typically +/-150mm. LiDAR data is provided in two formats:

- Digital Surface Model (DSM), which includes vegetation and buildings; and
- Digital Terrain Model (DTM), which is filtered to remove the majority of buildings, structures and vegetation.

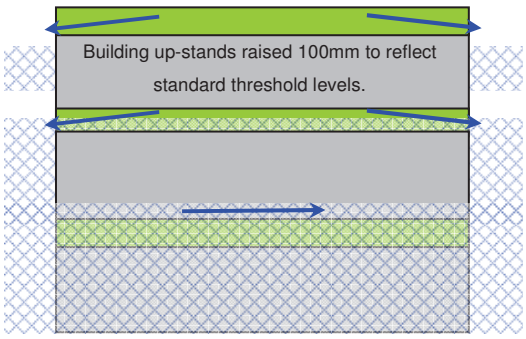
2.4.3 For the purpose of this study, the Digital Terrain Model (DTM) was used to represent the 'bare earth' elevation, with buildings, structures and vegetation removed. This is a conservative assumption as in reality these items would obstruct flood flows, thus potentially impacting on flood velocity and depth.

2.4.4 LiDAR data was not available for a small part of the study area. DTM data was purchased from GeoPerspectives for these areas which are identified on Figure A.1. This data has a resolution of 5m and the stated vertical accuracy is +/-1500mm.

2.4.5 Following initial model runs is was apparent that model instability occurred in a number of areas with sudden changes in topography such as the cliffs association with disused chalk pits in Frindsbury as well as Bores Hole near Cuxton, and the disused moat associated with Fort Amherst and Prince William's Bastion in Chatham. The ZSHP function in TuFLOW was used to smooth the changes in topography in these areas to improve the stability of the model. An example of the use of the ZSHP function for this purpose is shown in Figure A.2

2.5 Building representation

2.5.1 Building footprints have been represented in the model through the use of an 'up-stand' and higher roughness coefficients to mimic reduced conveyance through the footprints of the buildings. The 'up-stand' is derived based upon Ordnance Survey Master Mapping (OSMM) last revised in 2010, and is set at 100mm above the average ground level within each building footprint to represent the average threshold level of properties.



As the rainfall event begins, rainfall will fall onto the raised building pad and create flowpaths around the structure. The reduced Mannings (=0.015) is applied to the surface of the pad (only) to reduce any ponding occurring within the building pad itself and promote runoff from this area.

As the depth of flooding increased the Mannings of 0.015 is still being applied on the surface of the building pad until a depth of 30mm is attained.

As the depth of flooding increases, a high Manning's n value of 0.5 is then applied to the building to reflect the resistance to flow over the buildings pads surface (the low 0.015 is only applied the depths of flooding on the pad which are less than 30mm).

Building Pad Threshold = 100 mm
Area where variable Mannings roughness is applied = 30mm
Floodwater

Figure 2.1 Representation of buildings

2.6 Structures

2.6.1 In some parts of the model domain, it was necessary to modify the representation of the topography from that produced from the LiDAR data alone. Two approaches have been used to amend the topographic representation and to model structures in the model domain.

2.6.2 Structures within the study area which were modelled in the 2D domain include larger features such as rail or road overpasses, for example where roads pass underneath the rail line running from Chatham to Rochester, or where Claremont Way passes under New Road (A2) in Chatham. The structures were represented by using the ZLN or ZSHP function in TuFLOW which allows the user to specify the dimensions of the feature. Invert levels were determined by inspecting the LiDAR DTM. The widths of these features were either measured on site visits, from aerial photography, or from the LiDAR DTM.

2.6.3 The 2D domain has a grid size of 5m, and therefore it is not possible to accurately represent smaller structures and features using this approach. As a result, ESTRY has been used to represent these elements in a 1D domain linked to the 2D model domain. As opposed to a 2D representation of such structures, a 1D representation allows the width of the structure to be specified without being limited to grid size. Structures modelled in 1D using ESTRY include underpasses and culverts. For example in Gillingham, ESTRY was used to represent short sections of Pier Road and Medway Road where they pass under the rail line. ESTRY was also used for smaller structures, for example a pedestrian subway underneath Ito Way (A289), where it joins Sovereign Boulevard.

2.6.4 The dimensions of the structures were approximated from a review of aerial photography, observations made during the site walkover and interrogation of the DTM. Unlike structures modelled in 2D, rainfall is only allowed to enter the structure through the entrances of the structure and not from above.

2.6.5 Following the initial model simulations, a site walkover was undertaken for particular areas to verify the results. This identified further structures, such as culverts, that potentially have an influence on the propagation of surface water for inclusion within the models. The walkover informed the representation of structures already represented with the models.

2.7 Rainfall boundaries

2.7.1 The pluvial modelling is designed to analyse the impact of heavy rainfall events across Medway by assessing flow paths, velocities and catchment response.

2.7.2 In order to ensure that the worst case scenario is assessed and that the entire catchment is contributing to surface water runoff, the critical storm duration has been estimated.

2.7.3 In order to determine the rainfall profiles to be applied to the models, catchment descriptors for centre points of hydrological sub-catchments within each model area were exported from the Flood Estimation Handbook (FEH).

2.7.4 The Revitalised Flood Estimation Handbook (ReFH) method was used to carry out a high level investigation of critical storm duration for a number of distinct catchments within each model domain. Results indicated that critical storm duration varied greatly across model domains, even within a relatively small area. Ideally, model simulations would therefore be carried out applying a range of critical storm durations across the model domains.

2.7.5 However due to the large area to be modelled, approximately 267km^2, and the resultant long simulation times for 2D models, such an approach is not practical. Following the critical storm duration analysis, the decision was therefore taken to run all models with a single rainfall duration.

2.7.6 The range of critical storm durations for all models and sub-catchments was analysed and a single duration of 3 hours was selected, in order to represent a compromise between rainfall event duration and rainfall intensity across the modelled area.

2.7.7 The use of a 3 hour critical storm duration for all models also ensures consistency and comparability of model results across Medway District, and for practical purposes limits model run times to approximately 6 hours.

2.7.8 The Flood Map for Surface Water (FMfSW, 2010) and Areas Susceptible to Surface Water Flooding (SWtSWF, 2009) mapping applied critical storm durations of 1.1 hours and 6.5 hours respectively. The critical storm duration chosen for the Medway modelling therefore lies within

the expected range for surface water modelling rainfall event durations, however it represents a different scenario to those modelled during previous studies.

2.7.9 Based on a critical storm duration of 3 hours (180 minutes), rainfall profiles (hyetographs) for the following rainfall events were generated:

- 3.3% AEP (1 in 30 year)
- 1% AEP (1 in 100 year) plus climate change (+30%)
- 0.5% AEP (1 in 200 year)

2.7.10 These were created by importing catchment descriptors and storm durations into the Rainfall Profile function of WinDes® software. The Rainfall Profile provides rainfall intensity (in mm/hr) for each minute of the storm. The Rainfall Profile function of WinDes® is unable to include an addition for climate change. Therefore, 30% (the figure provided within the Technical Guidance to the NPPF to account for climate change over the next 100 years) was added to the hyetograph.

2.7.11 Due to the decision to use a single critical storm duration across all model domains, sensitivity testing was carried out to provide an indication of the sensitivity of model output i.e. flood depths, to variation in the critical storm duration. This provides an indication of the influence of the choice of critical storm duration on model results. Further detail on the sensitivity testing carried out is provided in Section 2.12.

2.8 Runoff coefficients and drainage losses

2.8.1 Runoff coefficients have been applied to the rainfall profiles in order to represent the varying level of infiltration on different land use surfaces, therefore altering the input data directly. Table 2.1 shows the runoff coefficients that have been applied within the models based upon OSMM data land use categories.

2.8.2 In addition to variation in the rate of surface water runoff, the model also accounts for losses to the Southern Water surface water sewer network where it is present. Table 2.1 also includes details of the continuing losses to the drainage system, which is 12mm/hr based on best practice (EA FMfSW guidance doc).

Table 2.1 Runoff coefficients

OS Master Map Feature Code	Descriptive Group	Comment	Runoff Coefficient	Drainage - Continuous Loss (mm/hr)
10021	Building		0.9	12
10053	General Surface	Residential yards	0.5	12

OS Master Map Feature Code	Descriptive Group	Comment	Runoff Coefficient	Drainage - Continuous Loss (mm/hr)
10054	General Surface	Step	0.8	12
10056	General Surface	Grass, parkland	0.35	0
10062	Building	Glasshouse	0.95	12
10076	Land; Heritage And Antiquities		0.85	12
10089	Water	Inland	1	0
10111	Natural Environment (Coniferous/Non Coniferous Trees)	Heavy woodland and forest	0.2	0
10119	Roads Tracks And Paths	manmade	0.85	12
10123	Roads Tracks And Paths	tarmac or dirt tracks	0.75	12
10167	Rail		0.35	12
10172	Roads Tracks And Paths	Tarmac	0.85	12
10183	Roads Tracks And Paths (roadside)	Pavement	0.85	12
10185	Structures	Roadside structure	0.9	12
10187	Structures	Generally on top of buildings	0.9	12
10203	Water	foreshore	1	0
10210	Water	tidal water	1	0
10217	Land (unclassified)	Industrial Yards, Car Parks	0.85	12

2.9 Roughness coefficients

2.9.1 Given the shallow depths of flooding, in comparison to fluvial or tidal flooding, roughness values have an influence on the surface water flood flow paths and as such need to be represented accurately within pluvial models.

2.9.2 OSMM data has been used to specify varying Manning's roughness coefficients across the five models according to land use. The polygons contained in the Master Map dataset area were queried in MapInfo and the land uses have been split into groups, with a Manning's n roughness coefficient assigned to each land use category.

Table 2.2 Roughness coefficients

OS Master Map Feature Code	Descriptive Group	Comment	Manning's Roughness
10021	Building		0.015 (Depth <= 30mm) 0.500 (Depth > 30mm)
10053	General Surface	Residential yards	0.04
10054	General Surface	Step	0.025
10056	General Surface	Grass, parkland	0.03
10062	Building	Glasshouse	0.015 (Depth <= 30mm) 0.500 (Depth > 30mm)
10076	Land; Heritage And Antiquities		0.5
10089	Water	Inland	0.035
10111	Natural Environment (Coniferous/Non Coniferous Trees)	Heavy woodland and forest	0.1
10119	Roads Tracks And Paths	manmade	0.02
10123	Roads Tracks And Paths	tarmac or dirt tracks	0.025
10167	Rail		0.05
10172	Roads Tracks And Paths	Tarmac	0.02
10183	Roads Tracks And Paths (roadside)	Pavement	0.02
10185	Structures	Roadside structure	0.03
10187	Structures	Generally on top of buildings	0.5
10203	Water	foreshore	0.4
10210	Water	tidal water	0.035
10217	Land (unclassified)	Industrial Yards, Car Parks	0.035

2.10 Model scenarios and simulations

2.10.1 Table 2.3 sets out the model design runs that have been carried out for each of the five models as well as the suggested use for the outputs for each of the return periods. When considering climate change for rainfall events, a 30% increase has been applied. This is based upon information within the NPPF5 and PPS25 Practice Guide[6].

Table 2.3 Modelled scenarios and suggested use

Modelled Return Period	Suggested Use
3.3% AEP Probability of occurrence is 1 in 30 in any given year	Southern Water sewers are typically designed to accommodate rainfall event with a 3.3% AEP period or less. This GIS layer will help to identify areas that may be prone to regular flooding and could be used by highway teams to inform maintenance regimes.
1% AEP + climate change Probability of occurrence is 1 in 100 in any given year, plus a 30% allowance for climate change	The NPPF requires that the impact of climate change is fully assessed. Reference should be made to this flood outline by the spatial planning teams to assess the sustainability of future developments.
0.5% AEP Probability of occurrence is 1 in 200 in any given year	To be used by emergency planning teams when formulating emergency evacuation plans from areas at risk of flooding.

2.10.2 All models were initially run for six hours and then assessed to determine whether this duration was sufficient to allow full propagation of all surface water flow paths within each model. A six hour simulation time was considered appropriate for all five of the models.

2.11 Model stability

2.11.1 Assessing the stability of a model is a critical step in understanding the robustness of a model and its ability to simulate a flood event accurately. Stability in a TuFLOW model can be assessed by examining the cumulative error (or mass balance) of the model as well as the warnings outputted by the model during the simulation.

2.11.2 A review of the mass balance output files shows that the cumulative error of the models is largely within the recommended range of +/-5% for the majority of the simulation. High values

[5] CLG (March 2012) National Planning Policy Framework
[6] CLG (December 2009) Planning Policy Statement 25: Development and Flood Risk Practice Guide

are reported at the beginning of the rainfall event when the model cells first wet then settle down for the remainder of the simulation. The cause and location of the high cumulative errors was investigated by examining a number of other output files provided by TuFLOW. The high values were found to occur at isolated locations throughout the study area for a single timestep and were not found to persistently occur at a single cell. This suggests that the high cumulative error is a consequence of the initial wetting process at the start of the rainfall event. The high cumulative error values are therefore considered to have a negligible impact on the overall model results.

2.11.3 A number of warnings occur in all models. The warnings relate to areas of poor convergence, or in other words, where TuFLOW has had trouble finding a solution. The warnings were found to be spatially varied and non-persistent in time, which is a relatively common occurrence in these types of models. As the warnings were not found to repeatedly occur, these have a negligible impact on the overall model results and the model is considered fit for purpose.

2.12 Sensitivity analysis

2.12.1 Understanding the performance of a model is fundamental to the modelling process, as the fitness for purpose of a model must be demonstrated in order to apply confidence to the model results.

2.12.2 Calibration of the model is important to provide assurance that the model structure represents the study area appropriately. In the absence of suitable calibration data, greater emphasis should be placed on sensitivity testing of the model in order to gain understanding of the relationship between key input variables.

2.12.3 Uncertainties associated with numerical coefficients used to simulate 'real life' factors should be assessed in order to reinforce confidence in model outputs. If sensitivity testing shows that model outputs depend heavily on a particular factor, then further development of the model may be required to produce a more robust schematisation. Alternatively, the model outputs would require a caveat to make users of the results aware of the dependency on a particular factor.

2.12.4 In order to assess the magnitude of change arising from the sensitivity analysis, 30 points within the MED2 model domain have been selected and the change in depth arising from each test analysed. Placement of sensitivity testing points was based on location of flooding incidents recorded by Medway District Council between April 2001 and March 2011. Areas indicated as at risk from significant flooding by the baseline modelling were also deemed suitable testing points.

Storm Duration

2.12.5 Longer duration storms are generally characterised as featuring lower peak rainfall intensities in comparison to short duration storms within the same return period. Although a storm profile will feature a lower peak rainfall rate, sustained rainfall into a catchment area can highlight flooding mechanisms which would not come into force during a short duration event.

2.12.6 The variation of model outputs following changes to the critical storm duration, and therefore rainfall intensity, was examined. The 3 hour critical storm duration was chosen for the baseline modelling for all Medway models to ensure result consistency and comparability across the entire Medway district.

2.12.7 In order to determine the rainfall profile that should be applied to the MED2 model to test the sensitivity of the model outputs to critical storm duration, catchment descriptors for the centre point of the model area were exported from the Flood Estimation Handbook (FEH).

2.12.8 By importing the catchment descriptors into the Revitalised Flood Estimation Handbook (ReFH) a critical storm duration of 102 minutes (1.7 hours) was estimated for the MED2 model.

2.12.9 To examine the effect of storm duration on the model outputs sensitivity analysis was undertaken using the 1% AEP + CC storm event run with 3 and 1.7 hour rainfall profiles. The total rainfall depths applied for the 1.7hr and 3hr storm are 80.0mm and 88.9mm respectively. Figure 2.2 shows how the hyetograph for these different rainfall durations differs.

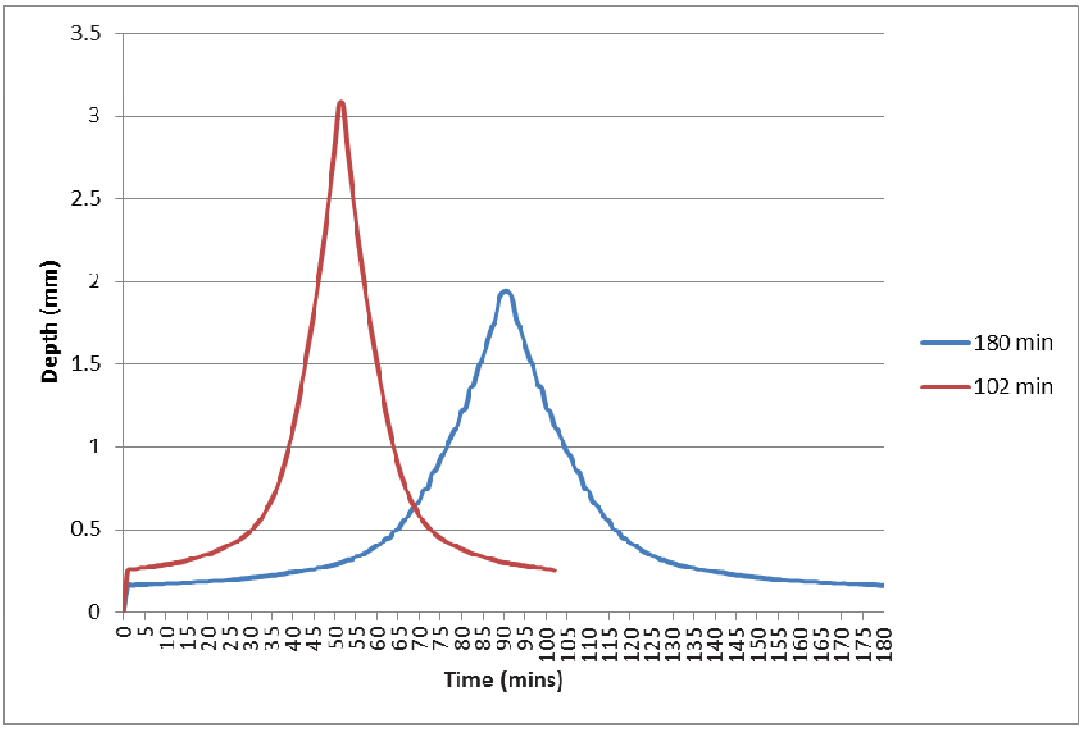


Figure 2.2: 100 year rainfall profiles (with an allowance for climate change) with varying storm duration

2.12.10 The flood extent and depth from the 1.7 hour rainfall event is generally greater than that of the 3 hour rainfall event. The assessment of the sensitivity testing locations shows a mean increase of peak flood depth of 0.03m (standard deviation 0.08). Of the 30 sensitivity testing locations, 5 experience a decrease in flood depths for the 1.7 hour rainfall event. Whilst the total rainfall depth applied to the model is greater for the 3 hour rainfall event, the rainfall intensity is far greater for the 1.7 hour event and therefore rainfall is input to the model more rapidly. The standard deviation of 0.08 indicates that the degree of change in flood depths does not vary significantly throughout the sensitivity testing locations.

Sensitivity Testing Conclusions

2.12.11 The sensitivity testing has highlighted that the model is relatively insensitive to changes in the critical storm duration. That is, changes in the rainfall profile result in minor variations in modelled flood depth. At 5 of the 30 sensitivity testing locations mean peak flood depth decreases for the shorter critical storm duration, indicating that the nature of changes in model outputs vary spatially throughout the model domain, though not to a great degree.

2.13 Calibration and verification data

2.13.1 The validity of each of the hydraulic models has been assessed using the following three sources of information:

- EA Flood Map for Surface Water Maps – A visual comparison of both data sets shows a good correlation between areas identified by the EA as being at greater risk of surface water flooding and pluvial modelling outputs
- Historic data provided by Medway Council representatives – Where available, historic flood records provided by the Councils have been plotted against pluvial modelling results
- Discussions with the Medway Council regarding pluvial modelling outputs

2.14 Model log

2.14.1 A completed Model Log and Quality Assurance form has been completed as part of the modelling process. The Model Log details the model build and the approach taken by the modeller, for example, details of the representation of specific structures and inclusion of specific boundaries within the models. The QA form documents URS' internal review of the models.

3. Model Results and Outputs

3.1 Maximum flood depth

3.1.1 The main output from the TuFLOW pluvial modelling is mapping of the maximum flood depth experienced across the study area. The maximum flood depth experienced at each cell across the model domain has been thematically mapped using the legend displayed in the following table. Maximum flood depth for the 3.3% AEP event has also been thematically mapped along with Medway District Council recorded flood incidents (Figure 3.1 of the main LFRMS report).

Table 3.1 Maximum Flood Depth Legend

	Maximum flood depth (m)
	< 0.1m
	0.1m to 0.25m
	0.25m to 0.5m
	0.5m to 1.0m
	1.0m to 1.5m
	> 1.5m

3.2 Flood hazard

3.2.1 Flood hazard is a function of both the flood depth and flow velocity at a particular location. The model outputs of flood depth and flow velocity (for each element in the model) were therefore used to determine flood hazard categories within the flood cell. Each grid cell within the TuFLOW model domain has been assigned one of four hazard categories: 'Extreme Hazard', 'Significant Hazard', 'Moderate Hazard', and 'Low Hazard'.

3.2.2 The derivation of these categories is based on Flood Risks to People FD23207, using the following equation:

$$\text{Flood Hazard Rating} = ((v+0.5)*D) + DF$$

(Where v = velocity (m/s), D = depth (m) and DF = debris factor)

3.2.3 The depth and velocity outputs from the 2D hydrodynamic modelling are used in this equation, along with a suitable debris factor. For this study, a precautionary approach has been adopted in line with FD2320; a debris factor of 0.5 has been used for depths less than and equal to 0.25m, and a debris factor of 1.0 has been used for depths greater than 0.25m.

[7] Defra, Environment Agency (2005) FD2320 Flood Risks to People

Table 3.2 Hazard categories based on FD2320, Defra & Environment Agency 2005

Hazard Rating		Description
HR < 0.75	**Low**	**Caution** – Flood zone with shallow flowing water or deep standing water
0.75 ≥ HR ≤ 1.25	**Moderate**	**Dangerous for some** (i.e. children) – Danger: flood zone with deep or fast flowing water
1.25 > HR ≤ 2.0	**Significant**	**Dangerous for most people** – Danger: flood zone with deep fast flowing water
HR > 2.0	**Extreme**	**Dangerous for all** – Extreme danger: flood zone with deep fast flowing water

3.3 Flood risk to properties

3.3.1 A count of the indicative number of properties shown to be at risk from the pluvial modelling has been undertaken.

3.3.2 OSMM data was used to create a dataset of all the buildings with an area greater than 25m2 within the modelled study area. GIS analysis was undertaken to determine the average flood depth within each building footprint during each of the modelled return periods. The EA National Receptor Dataset (NRD) was then queried against the buildings layer to determine the number of address points within each building footprint as well as the classification of the property based on MCM Codes (MCM Codes can be found in Appendix 3.1 of the Multi-Coloured Manual8).

3.3.3 This information was then used to provide counts for the following criteria during the 0.5% AEP (1 in 200 year) modelled flood event:

- No. of residential properties at risk of flooding to a depth equal to or greater than 0.1m
- No. of non-residential properties at risk of flooding to a depth equal to or greater than 0.1m
- No. of residential properties at risk of flooding to a depth equal to or greater than 0.5m
- No. of non-residential properties at risk of flooding to a depth equal to or greater than 0.5m

3.3.4 The results are presented in the following table.

[8] Flood Hazard Research Centre (2010) Multi-Coloured Manual

Table 3.3 Property and infrastructure at risk of pluvial flooding

Receptor	At risk of flooding to a depth of ≥ 0.1m during the 0.5% AEP modelled rainfall event	At risk of flooding to a depth of ≥ 0.3m during the 0.5% AEP modelled rainfall event
Residential	14,200	2,200
Commercial / Industrial	700	300
Infrastructure	100	0
Other	0	0
Unclassified	9,300	2
Total	24,300	4,500

Notes:

1. The EA National Receptor Database (NRD) has been used to identify receptors at risk of flooding. The type of receptor has been identified based on definitions (MCM Codes) within Appendix 3.1 of the Multi-Coloured Manual and divided into sub-categories.
2. Building thresholds have been represented in the modelling as 'up-stands', raised 100mm above the average ground level within the building footprint. A depth of >0.1m will result in a flood level of 0.1m above the property threshold.

3.4 Model uncertainty

3.4.1 Model validation can provide an indication of the uncertainty associated with modelled flood depths through comparison with previous modelled data, recorded flood incidents, and discussion with local stakeholders. Details of information used in the validation process are provided in Section 2.13.

3.4.2 Sensitivity testing allows analysis of the influence of model parameters on outputs.

3.4.3 Uncertainty in model outputs arises through the use of numerical coefficients used to simulate 'real life' factors. The selection of model parameters to represent such factors is necessary in the absence of appropriate data to inform aspects of the model.

3.4.4 Model parameters can potentially have a large impact on the model outputs, thereby impacting on confidence in model results. Sensitivity testing allows analysis of the impact of such parameters, through identification of the variation of model outputs as model parameters are varied one at a time. This analysis has been discussed in Section 2.12.

4. Conclusions and Recommendations

4.1.1 The pluvial modelling undertaken to inform the LFRMS for Medway Council represents a strategic approach to identify areas at risk of pluvial flooding. It represents a significant refinement on the previously available information on surface water flooding across the Medway Council administrative area. The models and their mapped results should only be used in conjunction with the information set out in this technical appendix. Recommendations for future improvements to the models include (but are not limited to) the following:

- Explicitly model the existing drainage network in key areas of risk, as opposed to a study area - wide assumption on drainage capacity
- Inclusion of survey data for critical structures
- Inclusion of river flows and channel capacity (where applicable)
- Reduction in model grid size in key areas of risk
- Further testing of different storm durations
- Inclusion of defacto defences outside of the scope of the current project (e.g. assets identified through the Asset Register process)
- The use of better quality or more up to date topographic information particularly in areas of recent development and where the most accurate LiDAR was not available.

Glossary

Annual Exceedance Probability (AEP)

The average probability of a rainfall event occurring in any given year.
Above Ordnance Datum (AOD)

The standard datum which topographic levels are quoted relative to throughout the study area.
Climate Change

When included as part of a flood event return period scenario, it means that that scenario includes the anticipated affects of climate change. For rainfall events, it incorporates a 30% increase. These climate change values are based upon information within the NPPF and PPS25 Practice Guide.
Culvert

A channel or pipe that carries water below the level of the ground.
Digital Terrain Model (DTM)

Digital representation of ground surface topography
ESTRY

ESTRY, which is a part of the TUFLOW software, is a 1D network dynamic flow software suitable for mathematically modelling floods and tides (and/or surges).
Flood and Water Management Act (FWMA)

Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Flood Hazard

The derivation of flood hazard is based on the methodology in Flood Risks to people FD2320 using and is a function of flood depth, flow velocity and a debris factor.
Flood Map for Surface Water (FMfSW)

National surface water flood risk mapping published by the EA. This dataset provides an indication of the broad areas likely to be at risk of surface water flooding during the 0.5% and 3.3% AEP rainfall events.
Flood Risk Regulations 2009 (FRR 2009)

Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.
Lead Local Flood Authority (LLFA)

Lead Local Flood Authority in relation to an area in England means the unitary authority for the area, or if there is no unitary authority, the county council for the area (as defined by the FWMA).
LiDAR

Light Detection and Ranging data is obtained from an airborne survey technique that uses a laser to measure the distance between an aircraft and the ground surface.
Local Flood Risk Management Strategy (LFRMS)

A strategy for the management of local flood risk (that from surface water, groundwater and ordinarywatercourses), to be developed, maintained, applied and monitored by the LLFA, as a duty under the FWMA.
National Receptor Database (NRD)

A collection of risk receptors produced by the Environment Agency.
Ordnance Survey Master Map (OSMM)

OS Master Map is highly detailed mapping including individual buildings, roads and areas of land according to land use categories. The data is presented in GIS as polygon and line data.
Pluvial modelling

Flooding from water flowing over the surface of the ground; often occurs when the soil is saturated and natural drainage channels or artificial drainage systems have insufficient capacity to cope with additional flow.

Preliminary Flood Risk Assessment (PFRA)

A report required under the FRR 2009 for each LLFA administrative area, detailing information on past and future (potential) floods, and identifying Flood Risk Areas. LLFAs are only required to undertake a PFRA for local sources of flooding, which principally includes surface water, groundwater and ordinary watercourses.

TuFLOW

TuFLOW is a modelling package for simulating depth averaged 2D free-surface flows and is in widespread use in the UK and elsewhere for 2D inundation modelling.

A. Appendix A – Study Area Mapping

B. Appendix B – Maximum Flood Depth Mapping

Figure B.1 Maximum flood depth – 3.3% AEP event
(Figures B.1.a – B.1.l provide 1:20,000 scale coverage of the study area).

Figure B.2 Maximum flood depth – 1% AEP event including 30% climate change allowance
(Figures B.2.a – B.2.l provide 1:20,000 scale coverage of the study area).

Figure B.3 Maximum flood depth – 0.5% AEP event
(Figures B.3.a – B.3.l provide 1:20,000 scale coverage of the study area).

C. Appendix C – Flood Hazard Mapping

Figure C.1 Flood hazard rating – 3.3% AEP event
(Figures C.1.a – C.1.l provide 1:20,000 scale coverage of the study area).

Figure C.2 Flood hazard rating – 1% AEP event including 30% climate change allowance
(Figures C.2.a – C.2.l provide 1:20,000 scale coverage of the study area).

Figure C.3 Flood hazard rating – 0.5% AEP event
(Figures C.3.a – C.3.l provide 1:20,000 scale coverage of the study area).

D. Appendix D – Sensitivity Analysis

Table D.1 – Sensitivity Analysis - 1.7 hour Critical Storm Duration 1% AEP event including 30% climate change allowance

(Figures D.1.a – D.1.l provide 1:20,000 scale coverage of the study area).

Figure D.1 – Sensitivity Analysis - 1.7 hour Critical Storm Duration 1% AEP event including 30% climate change allowance

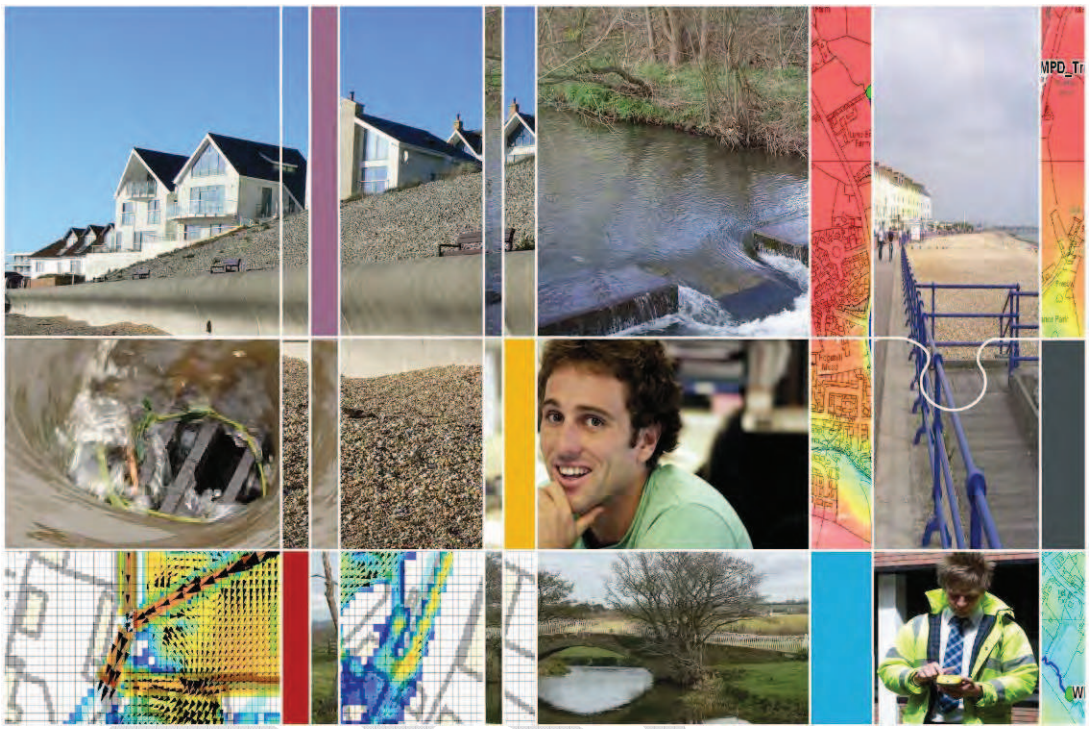
Table D.1 Sensitivity Analysis. Comparison of 3 hour (baseline) and 1.7 hour (sensitivity test) storm duration, 1% AEP event including 30% climate change allowance.

Sensitivity Test Point	Maximum flood depth (m)		Difference (sensitivity test - baseline)	
	3hr rainfall event (baseline)	1.7hr rainfall event (sensitivity test)	(m)	%
ST_Location_01	1.86	1.92	0.06	3.2
ST_Location_02	1.24	1.30	0.06	4.8
ST_Location_03	1.86	1.89	0.03	1.6
ST_Location_04	1.73	1.71	-0.02	-1.2
ST_Location_05	0.55	0.67	0.12	21.8
ST_Location_06	0.13	0.15	0.02	15.4
ST_Location_07	1.77	1.96	0.19	10.7
ST_Location_08	1.12	1.30	0.18	16.1
ST_Location_09	1.76	1.78	0.02	1.1
ST_Location_10	2.09	1.92	-0.17	-8.1
ST_Location_11	0.09	0.09	0.00	0.0
ST_Location_12	0.01	0.01	0.00	0.0
ST_Location_13	0.17	0.28	0.11	64.7
ST_Location_14	0.03	0.05	0.02	66.7
ST_Location_15	0.06	0.05	-0.01	-16.7
ST_Location_16	0.11	0.07	-0.04	-36.4
ST_Location_17	0.01	0.02	0.01	100.0*
ST_Location_18	0.00	0.02	0.02	100.0*
ST_Location_19	0.00	0.01	0.01	100.0*
ST_Location_20	0.01	0.03	0.02	200.0*
ST_Location_21	0.04	0.04	0.00	0.0
ST_Location_22	0.02	0.02	0.00	0.0
ST_Location_23	0.16	0.16	0.00	0.0
ST_Location_24	1.65	1.86	0.21	12.7
ST_Location_25	1.83	1.70	-0.13	-7.1
ST_Location_26	0.66	0.69	0.03	4.6
ST_Location_27	0.01	0.01	0.00	0.0
ST_Location_28	0.74	0.81	0.07	9.5
ST_Location_29	0.16	0.19	0.03	18.8
ST_Location_30	0.84	0.90	0.06	7.1
Mean			**0.03**	
Maximum			**0.21**	
Minimum			**-0.17**	
SD			**0.08**	

% difference values unrealistically highly due to the very shallow depth of flooding encountered.

Appendix 2 – Groundwater Assessment

Commission reference: LA020



Medway Council Local Flood Risk Management Strategy

Technical Appendix 2:
High Level Assessment of Groundwater Flooding Susceptibility
Final Report

October 2013

CAPITA SYMONDS | URS
Flood Risk Management

Document overview

Capita Symonds with URS Infrastructure and Environment UK Ltd was commissioned by Medway Council in the preparation of their Local Flood Risk Management Strategy as required under the Flood and Water Management Act 2010.

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Document history

Version	Status	Issue date	Prepared by	Reviewed by	Approved by
1	Draft for client review	Jun 2012	Christopher Woolhouse Hydrogeologist	Stephen Cox Principal Consultant Stephen Riley Principal Consultant	Jon Robinson Technical Director Scott Ferguson Technical Director
2	Final	September 2013	Edward Byers Assistant Flood Risk Consultant	Emily Craven Principal Consultant	Jon Robinson Technical Director

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Glossary

TERM	DEFINITION
Aquiclude (or unproductive strata)	Formations that may be sufficiently porous to hold water, but do not allow water to move through them.
Aquifer (secondary and primary)	Layers of rock sufficiently porous to hold water and permeable enough to allow water to flow through them in quantities that are suitable for water supply. The Environment Agency has classified the bedrock and superficial geology aquifers as secondary or primary.
Aquitard	Formations that permit water to move through them, but at much lower rates than through the adjoining aquifers.
Climate Change	Long term variations in global temperature and weather patterns, caused by natural and human actions.
Flood defence	Infrastructure used to protect an area against floods, such as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Floods and Water Management Act	Legislation constituting part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to help protect ourselves better from flooding, to manage water more sustainably and to improve services to the public.
Fluvial flooding	Flooding by a river or a watercourse.
Groundwater	Water that is underground. For the purposes of this study, it refers to water in the saturated zone below the water table.
Pluvial Flooding	Flooding as a result of high intensity rainfall when water is ponding or flowing over the ground surface before it enters the underground drainage network or watercourse, or cannot enter it because the network is full to capacity.
Risk	The product of the probability and consequence of the occurrence of an event.
Sewer flooding	Flooding caused by a blockage, undercapacity or overflowing of a sewer or urban drainage system.
Sustainable Drainage Systems	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques. The current study refers to the 'infiltration' category of sustainable drainage systems e.g. soakaways, permeable paving.

1. Introduction

1.1 Groundwater Flooding

1.1.1 Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from springs. This tends to occur after long periods of sustained rainfall, and the areas at most risk are often low-lying where the water table is more likely to be at shallow depth. Groundwater flooding is known to occur in areas underlain by principal aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels (secondary aquifers).

1.1.2 Groundwater flooding tends to occur sporadically in both location and time, and because of the more gradual movement and drainage of water, tends to last longer than fluvial, pluvial or sewer flooding. When groundwater flooding occurs, basements and tunnels can flood, buried services may be damaged, and storm sewers may become ineffective, exacerbating the risk of surface water flooding. Groundwater flooding can also lead to the inundation of farmland, roads, commercial, residential and amenity areas.

1.2 The Current Report

1.2.1 Medway Council is a designated Lead Local Flood Authority (LLFA) in accordance with the Flood and Management Act (FWMA) 2010. URS has been commissioned to prepare its Local Flood Risk Management Strategy (the 'strategy').

1.2.2 As part of the strategy this report provides a high level assessment of groundwater flooding susceptibility. The following sections outline the geology and hydrogeology in the Medway Council administrative area. From this analysis:

- Potential groundwater flooding mechanisms are identified;
- Evidence for groundwater flooding is discussed (if available);
- Areas susceptible to groundwater flooding are recognised; and
- Recommendations are provided for further investigation

2. Topography and Hydrology

2.1.1 The study area is defined by the administrative area of Medway Council, the Lead Local Flood Authority (LLFA), as shown in Figure 1.

2.1.2 The Hoo Peninsula forms the northern half of the administrative area (approximately 146 km2), largely comprising mud flats and marshlands that separate the Thames and Medway estuaries. The marshlands are close to sea level, although ground elevations are higher inland, reaching 74 maOD at Lodge Hill. A number of surface water courses drain the marshes including Cliffe Creek, Cliffe Fleet, Hope Fleet, Salt Fleet, Decoy Fleet and Yantlet Creek.

2.1.3 The Thames and Medway estuaries and the River Medway are the main surface water features in the administrative area. The tidal River Medway meanders southwest to northeast through the centre of the administrative area, with historic naval dockyards located at Rochester and Chatham.

2.1.4 The main towns of Rochester, Chatham and Gillingham form the southern half of the administrative area. The topographic highs approach 200 maOD and are located to the south near the M2 motorway, forming part of the North Downs. A dry chalk valley system runs northwest towards the tidal River Medway, with Chatham on the western slopes and Gillingham on the eastern slopes.

3. Geology

3.1.1 Figures 2 and 3 provide bedrock and superficial geological information for the administrative area of Medway Council and the surrounding area. Figure 4 presents a geological cross section that has been drawn as part of this study and is used to improve the hydrogeological conceptual understanding of the area.

3.2 Bedrock Geology

3.2.1 The bedrock geology in the study area is detailed in Table 3.1 in lithostratigraphical order, based on the BGS geological sheets 271 and 272. Where available, the regional thickness of the bedrock units is also presented based on the BGS Lexicon database (2012).

3.2.2 The main bedrock geology of the area comprises the Chalk Group of Cretaceous age, overlain by the Thanet Sand Formation (fine grained sand), Lambeth Group (clay mottled in part with beds of sand, pebbles and shells), Harwich Formation (sand with black flint pebbles) and London Clay Formation (clay, silty in part, sandy at the top and base).

3.2.3 The Chalk Group, which comprises several formations (Table 3.1), is found to outcrop at the surface across much of the southern half of the administrative area, along the North Downs. The largely undifferentiated Lewes Nodular Chalk, Seaford Chalk and Newhaven Chalk Formations (part of the White Chalk Subgroup) outcrop at Rochester, Gillingham and Chatham in the south, and also Cliffe on the Hoo Peninsula. Older Chalk formations, including the West Melbury Marly Chalk Formation, outcrop in the southwest corner of the administrative area near Upper Halling. In places the outcrop is obscured by superficial deposits (see Section 3.2).

3.2.4 The bedrock geology dips to the northeast, so that the younger Thanet Sand Formation and Lambeth Group outcrop in a northwest to southeast trending band across the centre of the administrative area, from Wainscott to Lower Rainham, respectively. A local syncline also causes these units to outcrop in the northwest of the administrative area around Cliffe. The outcrop is obscured in some areas by superficial deposits associated with the River Medway, Medway estuary and Thames estuary (see Section 3.2).

3.2.5 The London Clay Formation overlies the Lambeth Group and outcrops in the northern part of the administrative area on the Hoo Peninsula, including Chattenden and High Halstow, where superficial deposits are absent.

Table 3-1 – Bedrock Geology

Geological Units			Description	Regional Thickness
Eocene	London Clay Formation		Mixture of brown, grey, fine, sandy, silty clay and fine sand.	Up to 137m (up to 40m locally)
Paleocene to Eocene	Lambeth Group		Variable, component formations are Upnor Formation (glauconitic fine- to medium-grained sand with beds and stringers of well-rounded, black flint pebbles), Reading Formation (bluey, brown clay and sands) and Woolwich Formation (grey to grey-brown, interlaminated fine-grained sands, silts and clays).	Upnor Formation: 5 -6m Reading Formation: 12 - 16m Woolwich Formation: 11 – 12m Locally the Lambeth Group is up to 20m thick
Paleocene	Thanet Sand Formation		Fine grained sand, clayey and silty in the lower part, coarsening upwards.	21 – 40 m Approximately 37m locally
Cretaceous	White Chalk Subgroup	Newhaven Chalk	Soft to medium hard, smooth white chalks with marl seams and flint bands	45 – 75 m Not known locally
		Seaford Chalk	Firm white chalk with conspicuous semi-continuous nodular and tabular flint seams	55 – 60 m Not known locally
		Lewes Nodular Chalk	Hard, nodular, locally iron stained and flinty. Marl seams up to 0.1m are regular.	35 - 60m Not known locally
		New Pit Chalk Formation	Soft, smooth texture and massively bedded.	35 - 50 m Not known locally
		Holywell Nodular Chalk Formation	Nodular, gritty texture of broken shells. No flints	25 – 35 m Not known locally.
	Grey Chalk Subgroup	Zig Zag Chalk Formation	Marly, massively bedded chalk.	35 – 50 m Not known locally.
		West Melbury Marly Chalk Formation	Grey and off-white, soft, marly chalk and hard grey limestone	15 – 25 m Not known locally.

3.3 Superficial Deposits Geology

3.3.1 The superficial geology of the administrative area consists of Head, Alluvium, Beach and Tidal Flat Deposits, River Terrace Deposits and Clay with Flints Formation.

3.3.2 Head deposits form a significant outcrop in the study area, covering a large proportion of the Hoo Peninsula in the north, including the area of Cliffe, and from Allhallows to Hoo St Werburgh. There are exist ribbons of Head deposits associated with the Chalk valleys in the southern half of the study area. The geological map (Figure 3) for the area indicates that the deposits comprise clay, silt, sand and gravel. The thickness of the deposits is likely to be variable.

3.3.3 Significant Alluvium deposits occur at lower elevations on the Hoo Peninsula, associated with marshland. They also rest within the River Medway valley floor and form small islands within the Medway estuary. The deposits comprise mainly silty, peaty, sandy clay.

3.3.4 Beach and Tidal Flat Deposits are found along the northern coast of the Hoo Peninsula and within the Medway estuary. The deposits comprise mainly clay, silt and sand.

3.3.5 Patchy River Terrace Deposits formed of four terraces are located on the Hoo Peninsula in the area between Allhallows and Hoo St Weburgh, and on the Isle of Grain. Minor deposits can also be found near Wainscott and Gillingham. The River Terrace Deposits are predominantly sand and gravel, although near the edge of the Medway estuary at Hoo St Weburgh they comprise clay and silt.

3.3.6 On higher ground to the south of the study area around Chatham and Gillingham, the Clay with Flints Formation overlies the Chalk. The formation is described as, orange, brown sandy clay with abundant nodules and rounded pebbles of flint (BGS, 2012).

4. Hydrogeology

4.1.1 The hydrogeological significance of the various geological units within the study area is provided in Table 4.1. The range of permeability likely to be encountered for each geological unit is also incorporated in Table 4.1, based on BGS permeability data (BGS 2012b).

Table 4-1 – Geological Units in the Study Area and Hydrogeological Significance

Geological Unit	Table heading	Permeability (BGS)	Hydrogeological Significance (EA)
Superficial Deposits	Head	Very low – High	Secondary (Undifferentiated)
	Alluvium	Very low - Moderate	Secondary (Undifferentiated)
	Beach and Tidal Flat Deposits	Very low - Moderate	Secondary (Undifferentiated)
	River Terrace Deposits (sand and gravel)	High – Very High	Secondary (A) Aquifer
	River Terrace Deposits (clay and silt)	Very low – Low	Unproductive Strata
	Clay with Flints Formation	Very low – High	Unproductive Strata
Bedrock Geology	London Clay Formation	Very low – Low	Unproductive Strata
	Lambeth Group	Low – High	Secondary (A) Aquifer
	Thanet Sand Formation	Low – High	Principal Aquifer
	Chalk Group (except for West Melbury Chalk Formation and Zig Zag Chalk Formation)	Very High – Very High	Principal Aquifer
	Chalk Group (West Melbury Chalk Formation and Zig Zag Chalk Formation)	High – Very High	

The 'Hydrogeological Significance' is based on the Environment Agency (EA) classification:
'Principal Aquifer' - layers that have high permeability. They may support water supply and/or river base flow on a strategic scale.
'Secondary Aquifer (A)' - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
'Secondary (Undifferentiated)' - Been assigned in cases where it has not been possible to attribute either category A or B to a rock type. Previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
'Unproductive Strata' These are rock layers or superficial deposits with low permeability that have negligible significance for water supply or river base flow.

4.2 Bedrock Hydrogeology

Bedrock Hydrogeological Units

4.2.1 The Chalk Group is classified as a principal aquifer by the Environment Agency and permits groundwater flow. The aquifer underlies much of the southern half of the administrative area and forms an important groundwater resource, supporting a number of licensed groundwater abstractions and base flow to the River Medway. The Chalk Group is of significant interest to this current study.

4.2.2 The physical properties for minor aquifers in England and Wales (Jones et al., 2000) suggests the Thanet Sand Formation, Lambeth Group and the Harwich Formation are often considered

as a single groundwater unit, which is in hydraulic continuity with the Chalk. The Environment Agency classifies the Thanet Sand Formation as a principal aquifer and the Lambeth Group as a secondary (A) aquifer; they are both of interest to this study.

4.2.3 The London Clay Formation, which underlies the majority of the Hoo Peninsula, is an aquiclude and does not permit groundwater flow. It is classed by the Environment Agency as unproductive strata.

Bedrock Groundwater Levels

4.2.4 Water level data have been provided by the Environment Agency for 13 observation boreholes within the study area, all of which monitor water levels in the Chalk Group. The observation borehole locations are shown on Figures 1, 2 and 3 and the water level plots are presented in Appendix A.

4.2.5 The longest monitoring record is for Ranscombe (EA Ref. 442141001), which dates back to August 1968. This indicates that the highest water levels were experienced in the winter of 2000/01, as demonstrated by many of the other local observation boreholes.

4.2.6 In the area of Cliffe on the Hoo Peninsula, the water table in the Chalk is close to sea level and influenced by local groundwater abstractions, reaching a maximum of around 2 to 3 maOD (see Appendix A for records at APCM Ltd, Simmonds Hole and Cooling Castle). Ground levels reach 13 maOD at Cliffe, although at the margins of the settlement they are close to, or at the same elevation as, the water table in the Chalk.

4.2.7 Within the tidal River Medway valley, water levels in the Chalk are also close to sea level as expected, reaching a maximum of around 3 maOD in the winter of 2000/01 (see Appendix A for records at Cuxton Meter House and Halling Sewage Works). Ground level at the observation boreholes was only around 0.5 to 1.5 m higher than the water table at that time.

4.2.8 The Dene Farm observation borehole monitors water levels within a dry tributary valley of the River Medway to the west of Cuxton, where ground levels are around 12 to 13 maOD. Although the water table is often at least 10 m below ground level and close to sea level, in the winter of 2000/01 it rose to within 2 or 3 m of ground level.

4.2.9 On higher ground within the southern half of the study area, the observation borehole records indicate that the water table is always at significant depth (see Appendix A for records at Brompton, Ranscombe, Sharstead and Wigmore Reservoir).

4.3 Superficial Deposits Hydrogeology

Superficial Deposits and Hydrogeological Units

4.3.1 The Head, Alluvium and Beach and Tidal Flat Deposits are expected to behave as aquitards, although sand and gravel horizons may locally form a perched aquifer depending on their lateral extent and thickness. The coastal and estuarine deposits are likely to be in some

hydraulic continuity with the sea, and therefore groundwater levels are expected to demonstrate tidal fluctuations.

4.3.2 The River Terrace Deposits are expected to behave as a Secondary Aquifer (A) due to the dominance of sand and gravels; perched water tables will form within the deposits where they overlie the London Clay Formation aquiclude on the Hoo Peninsula.

Superficial Deposits and Water Levels

4.3.3 Medway Council and the Environment Agency do not monitor groundwater levels in the superficial deposits. However, borehole logs are available from the British Geological Survey and these often provide information on groundwater levels.

4.4 Groundwater / Surface Water Interactions

4.4.1 The published hydrogeological map (Figure 4) indicates that groundwater flow in the Chalk aquifer is towards the tidal River Medway and estuary systems. Therefore, the River Medway will receive significant base flow contributions from the Chalk aquifer.

4.4.2 The River Medway is tidal and much of the study area is estuarine or coastal. As sea and river levels rise and fall with the tides, this will have a local influence on the aquifers, and groundwater levels are expected to demonstrate a tidal response.

4.5 Groundwater Abstractions

4.5.1 The locations of licensed groundwater abstractions were requested from the Environment Agency and these are shown on Figures 1, 2 and 3. However, the larger public water supply abstractions are not shown for security reasons, although their source protection zones are provided on Figure 6.

4.5.2 The public water supply abstractions are located in the southern half of the study area. The smaller licensed abstractions are concentrated on the Hoo Peninsula, and provide irrigation water to farmland.

4.5.3 It is possible that in the future some of these abstractions may reduce or cease, either temporarily or for the longer term. If this occurs it is possible that water levels in the Chalk aquifer will increase, potentially increasing susceptibility to groundwater flooding in some areas.

4.6 Artificial Groundwater Recharge

4.6.1 Water mains leakage data for the Medway Council administrative area were not provided for this study. However it should be noted that recharge to groundwater by leaking mains could result in a local rise in groundwater levels. This rise might not prove significant under dry conditions, but could exacerbate the risk of groundwater flooding following and/or during periods of heavy rainfall.

4.6.2 The drainage/sewer network can act as a further source of artificial recharge. When pipes are installed within principal or secondary aquifers, the groundwater and drainage network may be in partial hydraulic connection. When pipes are empty, groundwater may leak into the drainage network with water flowing in through cracks and porous walls, draining the aquifer and reducing groundwater levels. During periods of heavy rainfall when pipes are full, leaking pipes can act as recharge points, artificially recharging the groundwater table and subsequently increasing groundwater levels with potential impacts on groundwater quality.

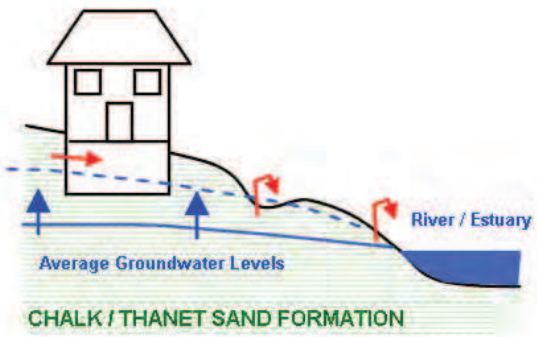
5. Assessment of Areas Susceptible to Groundwater Flooding

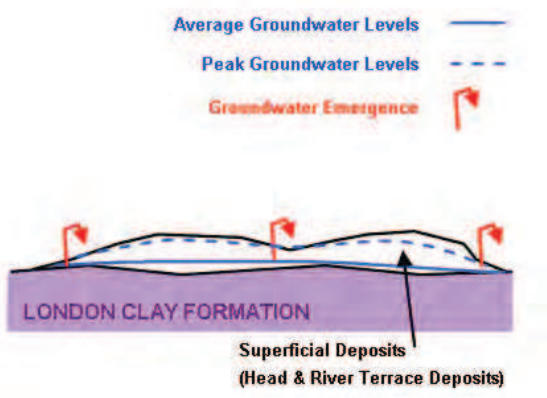
5.1 Groundwater Flooding Mechanisms

5.1.1 Based on the hydrogeological conceptual understanding of the study area, the key groundwater flooding mechanisms that may exist are:

- **Chalk Group and Thanet Sand Formation principal aquifers and Lambeth Group secondary A aquifer outcropping in the south of the study area at Rochester, Gillingham and Chatham, and on the Hoo Peninsula at Cliffe.** Environment Agency groundwater level data indicate a shallow water table in low lying areas, including the River Medway valley and its dry tributary valleys, and coastal / estuarine locations. Basements / cellars in these areas may be at risk from groundwater flooding after prolonged wet periods such as that experienced in the winter of 2000/01. In addition, groundwater springs could emerge within topographic depressions or near the base of tributary valleys that are usually dry (e.g. at Cuxton). Where superficial deposits such as Head and Alluvium overlie the bedrock aquifers (e.g. in the marshlands around Cliffe), these are likely to be in some hydraulic continuity with the bedrock aquifers so that groundwater flooding can still occur. However, the severity of the flooding is likely to be reduced.

- **Superficial deposits not in hydraulic continuity with bedrock aquifers, overlying the London Clay i.e. River Terrace Deposits and Head deposits on the Hoo Peninsula:** Perched water tables may develop within these deposits, through a combination of natural rainfall recharge and artificial recharge e.g. leaking water mains. The properties at risk from this type of groundwater flooding are probably limited to those with basements / cellars following prolonged wet weather. Another potential impact is a temporary loss of agricultural land in low lying areas.





5.2 Evidence of Groundwater Flooding

5.2.1 No specific groundwater flooding incidents have been reported to Medway Council. However, the Environment Agency holds records for 83 generic flood incidents that occurred between 2001 and 2011. The cause of flooding is not identified, although 9 of the records are related to basement or cellar flooding and could therefore be associated with groundwater flooding. All of the recorded historic flood incidents are presented on Figures 2, 3 and 5 and those linked to basement or cellar flooding are numbered 1 to 9.

5.2.2 Flood Incidents 1 to 9 (basement / cellar flooding) are located over the Chalk Group or Thanet Sand Formation aquifers where superficial deposits are sparse. However, only flood incidents 1, 2, 5 and 8 are located in low lying areas where water levels are likely to be close to ground level. Therefore, it is believed that these have the greatest potential to be groundwater flooding events.

5.3 Areas Susceptible to Groundwater Flooding

BGS Groundwater Flooding Susceptibility Maps

5.3.1 The BGS has produced a dataset showing areas susceptible to groundwater flooding based on topography, geological and hydrogeological conditions (see Figure 5).

5.3.2 The main areas within the study area identified as having a ‘very high’ or ‘high’ susceptibility to groundwater flooding are the Hoo Peninsula (including Cliffe and the Isle of Grain), the River Medway valley, and the southern margins of the Medway estuary.

5.3.3 None of the historic basement or cellar flood events (labelled 1 to 9) are encompassed by zones of higher susceptibility to groundwater flooding. However, flood events 1, 2, 5 and 8 are close to these zones. This indicates that either the BGS groundwater flooding susceptibility zones may need to be revised, or that these flood events are not associated with groundwater flooding.

5.3.4 In general, based on the available data, it is thought that the approximate areas identified by the BGS as being susceptible to groundwater flooding are as expected. There is lower confidence in the dataset where the London Clay Formation is overlain by Head and River Terrace Deposits on the Hoo Peninsula, as the Environment Agency does not monitor groundwater levels in these superficial deposits.

5.3.5 It is also worth noting that the BGS dataset does not take into account rebound of groundwater levels. There exist a number of groundwater abstractors across the study area. It is possible that if certain key abstractions were reduced or switched off, the areas susceptible to groundwater flooding may increase.

6. Assessment of Areas Suitable for Infiltration SuDS

6.1 Definition of SuDS, Environment Agency Guidance and the Water Framework Directive

6.1.1 In recent times, the installation of sustainable drainage systems (SuDS) has been encouraged for new and existing developments with the aim of reducing overall flood risk. The Flood and Water Management Act 2010 provides a definition of sustainable drainage:

"Sustainable drainage" means managing rainwater (including snow and other precipitation) with the aim of –

- **reducing damage from flooding,**
- **improving water quality,**
- **protecting and improving the environment,**
- **protecting health and safety, and**
- **ensuring the stability and durability of drainage systems.**

6.1.2 Infiltration SuDS rely on infiltration of runoff (from a developed site) into the soil and underlying aquifer e.g. soakaways and permeable paving. They have the potential to impact water levels and water quality in the aquifer, and so the Water Framework Directive (WFD) must be considered.

6.1.3 The European WFD is implemented in England by the Environment Agency through River Basin Management Plans (RBMP). These documents were published by the Environment Agency in December 2009 and they outline measures that are required by all sectors impacting the water environment. They also identify water bodies across England and their current status.

6.1.4 The key RBMP groundwater body within the study area is the North Kent Medway Chalk (GB40601G500300). This is currently in poor status with respect to both chemical (owing to general chemical assessment and drinking water protected area status) and quantitative status (owing to impact on surface waters and resource balance).

6.1.5 Improper use of infiltration SuDS could lead to flooding / drainage issues and also contamination of the underlying superficial deposit or bedrock aquifers; the latter adding to the poor status of the North Kent Medway Chalk water body. However, correct use of infiltration SuDS is likely to help improve the chemical and quantitative status of the water body and reduce overall flood risk.

6.1.6 Environment Agency guidance on the appropriate design of infiltration SuDS is available on their website at: http://www.environment-agency.gov.uk/business/sectors/39909.aspx. This

should be considered by developers and their contractors, and by Medway Council when approving or rejecting planning applications.

6.1.7 The following Sections provide an overview of the suitability for infiltrations SuDS within the Medway Council administrative area.

6.2 Infiltration SuDS Suitability Map

BGS Infiltration SuDS Suitability

6.2.1 The infiltration SuDS suitability map shown on Figure 6 is largely based on the BGS infiltration SuDS suitability dataset (BGS 2012c). It is understood from the BGS guidance notes that the dataset is derived from the following data:

- Infiltration constraints summary layer
- Superficial deposits permeability
- Superficial deposits thickness
- Bedrock permeability
- Depth to water level
- Geological indicators of flooding

6.2.2 Four score categories have been identified by the BGS for suitability for Infiltration SuDS:

1) **Highly compatible for Infiltration SuDS:** The subsurface is likely to be suitable for free-draining infiltration SuDS
2) **Probably compatible for Infiltration SuDS:** The subsurface is probably suitable for infiltration SuDS although the design may be influenced by the ground conditions
3) **Opportunities for bespoke infiltration SuDS:** The subsurface is potentially suitable for infiltration SuDS although the design will be influenced by the ground conditions
4) **Very significant constraints are indicated:** There is a very significant potential for one or more geohazards associated with infiltration

6.2.3 The areas delineated as 'Highly compatible for Infiltration SuDS' and 'Probably compatible for Infiltration SuDS' on Figure 6 are located over the Chalk Group and Thanet Sand Formation at Cliffe (on the Hoo Peninsula) and in the southern half of the study area. They are also associated with thick and permeable Head and River Terrace Deposits on the Hoo Peninsula.

6.2.4 It is noted that this is a high level assessment and only forms an approximate guide to infiltration SuDS suitability; a site investigation is required in all cases to confirm local conditions. The maximum likely groundwater levels should be assessed, to confirm that soakaways will continue to function even during prolonged wet conditions.

Historic Landfill Sites and Contaminated Land

6.2.5 Where possible, infiltration SuDS should be located away from areas of historic landfill (shown on Figure 6) and areas of known contamination or risk of contamination. This is to ensure that the drainage does not re-mobilise latent contamination and exacerbate the risk to groundwater

quality and down gradient receptors, such as abstractors, springs and rivers. A preliminary groundwater risk assessment should be included with the planning application.

Source Protection Zones

6.2.6 Restrictions on the use of infiltration SuDS apply to those areas within Source Protection Zones (SPZ). Developers must ensure that their proposed drainage designs comply with the available Environment Agency guidance. The BGS infiltration SuDS suitability dataset does not consider SPZs and so these are shown on Figure 6.

7. Conclusions and Recommendations

7.1 Conclusions

7.1.1 The following conclusions can be drawn from the current study:

- The bedrock geology underlying the southern half and northwest corner of the study area comprises the Chalk Group and Thanet Sand Formation. Both are classified by the Environment Agency as principal aquifers and are therefore a potential source of groundwater flooding;
- The bedrock geology across much of the northern half of the study area comprises the London Clay Formation, which is unproductive strata with little potential for groundwater flooding. However, between Hoo St Werburgh and Allhallows the superficial geology, which overlies the London Clay Formation, includes Head and River Terrace Deposits. There is potential for a perched water table to develop within these and therefore potential for groundwater flooding.
- Groundwater level monitoring data have been provided by the Environment Agency for the Chalk Group principal aquifer. These indicate that groundwater levels are close to sea level, and at a shallow depth below ground level adjacent to the tidal River Medway, the Medway estuary and on the Hoo Peninsula at Cliffe;
- There are no groundwater level monitoring data available for the superficial deposits, including the Head and River Terrace Deposits on the Hoo Peninsula;
- Flood events data have been collated by the Environment Agency. Unfortunately the type of flooding is not identified, although a number of records are associated with flooding of basements / cellars and could be groundwater related, particularly those in low lying areas;
- Areas susceptible to groundwater flooding have been identified using the BGS groundwater flooding susceptibility dataset. The data indicate a 'high' or 'very high' susceptibility to groundwater flooding on the Hoo Peninsula (including Cliffe and the Isle of Grain), the River Medway valley, and the southern margins of the Medway estuary. There is a poor correlation between the BGS dataset and those flood events data associated with basement flooding. This indicates that either the BGS dataset needs to be refined, or the basement flood events were not caused by groundwater flooding;
- The BGS groundwater flooding susceptibility dataset does not take into account rebound of groundwater levels. It is possible that if certain key groundwater abstractions were reduced or switched off, the areas susceptible to groundwater flooding may increase;
- In recent times, the installation of sustainable drainage systems (SuDS) has been encouraged for new and existing developments with the aim of reducing overall flood risk. The BGS infiltration SuDS suitability dataset indicates that the areas 'Highly compatible for Infiltration SuDS' and 'Probably compatible for Infiltration SuDS' are located over the Chalk Group and Thanet Sand Formation aquifers at Cliffe (on the Hoo Peninsula) and in the southern half of

the study area. They are also associated with thick and permeable Head and River Terrace Deposits on the Hoo Peninsula;

- The BGS infiltration SuDS suitability dataset does not consider source protection zones associated with large public water supply abstractions. These are an additional constraint on the use of infiltration SuDS and have been identified as part of this study.

7.2 Recommendations

7.2.1 The following recommendations are made based on the current study:

- The areas identified as having a high susceptibility to groundwater flooding should be compared with those areas identified as being susceptible to other sources of flooding e.g. fluvial, pluvial and sewer. An integrated understanding of flood risk will be gained through this exercise
- Data identifying properties with basements / cellars should be used to improve the understanding of susceptibility to groundwater flooding, if available
- Records of possible groundwater flooding should be corroborated by Medway Council using current data on local groundwater levels and antecedent condition local to potential groundwater flooding events at the time of the event

8. References

Ref 1 - British Geological Survey. 1:50,000 Scale Geology Series [Geological Map] Sheet 271 Morpeth: Bedrock and Superficial Deposits.

Ref 2 - British Geological Survey. 1:50,000 Scale Geology Series [Geological Map] Sheet 272 Tynemouth: Bedrock and Superficial Deposits.

Ref 3 - BGS Lexicon. May 2012. www.bgs.ac.uk.

Ref 4 - DEFRA, March 2010. Surface Water Management Plan Technical Guidance.

Ref 5 - Environment Agency, 2010. Areas Susceptible to Groundwater Flooding. Guidance Document

Ref 6 – BGS Permeability Data. 2012. http://www.bgs.ac.uk/products/hydrogeology/permeability.html

Ref 7 - BGS SuDS Suitability Data. 2012. http://www.bgs.ac.uk/products/hydrogeology/infiltrationSuds.html

Ref 8 - Jones, H K, Morris, B L, Cheney, C S, Brewerton, L J, Merrin, P D, Lewis, M A, MacDonald, A M, Coleby, L M, Talbot, J C, McKenzie, A A, Bird, M J, Cunningham, J, and Robinson, V K.. 2000. The physical properties of minor aquifers in England and Wales. British Geological Survey Technical Report, WD/00/4. 234pp. Environment Agency R&D Publication 68.

Appendix A – Environment Agency Observation Borehole Water Level Plots

Appendix B – Figures

Appendix 3 – Flood Risk Management Roles and Responsibilities

Roles and responsibilities of Medway Council

	Medway Council Flood Risk Management Functions
Flood and Water Management Act 2010	Medway Council has a duty to lead on local flood risk management, including establishing effective partnerships within their local authority as well as with other Risk Management Authorities such as the EA, Southern Water, Internal Drainage Boards, Highways Authority and neighbouring Local Authorities.
	Medway Council have a duty to investigate and record details of significant flood events within their area. This duty includes identifying which authorities have flood risk management functions and what their have done or intend to do with respect to the incident, notifying Risk Management Authorities where necessary and publishing the results of any investigations carried out. (FWMA Part 1 Section 19).
	Medway Council has a duty to develop, maintain, apply and monitor a strategy for local flood risk management in their area. The LLFA must publish a summary of its LFRMS (including guidance about the availability of relevant information). It may also issue guidance about the application of the LFRMS in its area. The LLFA must consult other Risk Management Authorities and the public who may be affected by the LFRMS. (FMWA Part 1 Section 9).
	Medway Council has a duty to maintain a register of structures or features that are likely to have a significant effect on flood risk in its area, including details on ownership and condition as a minimum. The register must be available for inspection. (FWMA Part 1 Section 21).
	Medway Council must aim to make a contribution towards the achievement of sustainable development when exercising a flood risk management function. (FWMA Part 1 Section 27).
	Medway Council has a duty to act as a Sustainable Drainage Systems (SuDS) Approving Body (SAB) for any new drainage system affecting more than one property. The SAB must approve, adopt and maintain any new SuDS within their area, which confirm to the National SuDS standards. (FWMA Part 1 Section This responsibility is not anticipated to commence before April 2013. (FWMA Schedule 3).

	Medway Council Flood Risk Management Functions
	Medway Council has a consenting and enforcement responsibility for ordinary watercourse regulation **for those ordinary watercourses that are not maintained by the Internal Drainage Board.**
	Medway Council has powers to request **a person to provide information in connection with the authority's flood and coastal erosion risk management functions. (FWMA Part 1 Section 14).**
	Medway Council has powers to designate structures and features that affect flooding in order to safeguard assets that are relied upon for flood risk management. Once a feature is designated, the owner must seek consent from the authority to alter, remove or replace it. (FWMA Schedule 1 Section 1).
	Medway Council have powers to undertake works to manage flood risk from surface water or groundwater, consistent with the LFRMS for their area. (FWMA Schedule 2 Section 29).
FRR 2009	Medway Council must revise the Preliminary Flood Risk Assessment (PFRA) at least every 6 years. The first review must be published by 22nd June 2017. (FRR Part 2 Section 10).
	Medway Council must prepare flood hazard and flood risk maps of relevant flood risk areas by 22nd June 2013 and revise these at least every 6 years. (FRR Part 3 Section 19).
	Medway Council must prepare a flood risk management plans for each flood risk area by 22nd June 2015 and revise these plans at least every 6 years. (FRR Part 4 Section 26).
	Medway Council has a duty to cooperate with other authorities exercising their functions under the FRR. (FRR Part 6 Section 35).
	Medway Council has powers to require information reasonably required in connection with their responsibilities as LLFA under the FRR from the authorities listed in Part 6 Section 36 Sub-section 3 of the FRR. (FRR Part 6 Section 36).

	Medway Council Flood Risk Management Functions
Civil Contingencies Act 2004[20]	Medway Council has a duty to: • assess the risk of an emergency occurring; • maintain plans for the purpose of ensuring that if an emergency occurs the person or body is able to continue to perform its functions; • arrange for the publication of all or part of assessments made and plans maintained for the purposes of preventing an emergency, reducing, controlling or mitigating the effects of an emergency, or enabling other action to be taken in connection with an emergency; and, • maintain arrangements to warn the public, and to provide information and advice to the public, if an emergency is likely to occur or has occurred. (Civil Contingencies Act 2004 Part 1 Section 2).
NPPF 2012	Medway Council, as LPA, should adopt proactive strategies to mitigate and adapt to climate change, taking full account of flood risk, coastal change and water supply and demand considerations. (NPPF Paragraph 94).
	Medway Council's Local Plans should be supported by Strategic Flood Risk Assessment and should develop policies to manage flood risk from all sources, taking account of advice from the EA and other relevant flood risk management bodies. (NPPF Paragraph 100).

Roles and responsibilities of the Environment Agency

	Environment Agency Flood Risk Management Functions

[20] HMSO and the Queen's Printer of Acts of Parliament (2004) Civil Contingencies Act

	Environment Agency Flood Risk Management Functions
Flood and Water Management Act 2010	The EA has a duty to develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management in England. The EA must publish a summary of its Strategy. It may also issue guidance about the application of the Strategy in its area. The EA must consult Risk Management Authorities and public on the National Strategy. (FMWA Part 1 Section 7).
	The EA must cooperate with other RMAs in the exercise of their flood risk management function and may share information with other RMAs for the purpose of discharging this duty. (FWMA Part 1 Section 13).
	The EA has powers to request a person to provide information in connection with the authority's flood and coastal erosion risk management functions. (FWMA Part 1 Section 14).
	The EA has powers to designate structures and features that affect flooding in order to safeguard assets that are relied upon for flood risk management. Once a feature is designated, the owner must seek consent from the authority to alter, remove or replace it. (FWMA Schedule 1 Section 1).
FRR 2009	The EA has a duty to prepare preliminary assessment maps and reports in relation to each river basin district with respect to flooding from the sea, main rivers and reservoirs. (FRR Part 2 Section 9).
	The EA has a duty to determine in relation to each river basin district whether there is a significant flood risk from the sea, main rivers or reservoirs. (FRR Part 2 Section 13).
	The EA has a duty to prepare in relation to each flood risk area; flood hazard and flood risk maps relating to flooding from the sea, main rivers and reservoirs. (FRR Part 3 Section 19).
	The EA has a duty to prepare flood risk management plans in relation to each flood risk area identified under Section 13. (FRR Part 4 Section 25).
	The EA has a duty to cooperate with other authorities exercising their functions under the FRR. (FRR Part 6 Section 35).
	The EA must comply with a request of Medway Council to provide information reasonably required in connection with their responsibilities as LLFA under the FRR. (FRR Part 6 Section 36).

	Environment Agency Flood Risk Management Functions
Civil Contingencies Act 2004	As a Category 1 Responder, the EA has a duty to: • assess the risk of an emergency occurring; • maintain plans for the purpose of ensuring that if an emergency occurs the person or body is able to continue to perform its functions; • arrange for the publication of all or part of assessments made and plans maintained for the purposes of preventing an emergency, reducing, controlling or mitigating the effects of an emergency, or enabling other action to be taken in connection with an emergency; and, • maintain arrangements to warn the public, and to provide information and advice to the public, if an emergency is likely to occur or has occurred. (Civil Contingencies Act 2004 Part 1 Section 2).

Roles and responsibilities of Southern Water

	Southern Water Flood Risk Management Functions
Water Industry Act 1991[21]	Southern Water has a duty to develop and maintain an efficient and economical system of water supply within its area and to ensure that all such arrangements have been made — • for providing supplies of water to premises in that area and for making such supplies available to persons who demand them; and • for maintaining, improving and extending the water undertaker's water mains and other pipes (Water Industry Act, 1991)
	Southern Water has a duty to provide and maintain a system of public sewers so that the areas for which they are responsible are effectually drained (Water Industry Act, 1991).

[21] HMSO and the Queen's Printer of Acts of Parliament (1991) Water Industry Act

	Southern Water Flood Risk Management Functions
	Southern Water must prepare, consult, publish and maintain a Water Resources Management Plan consisting of: • the water undertaker's estimate of the quantities of water required to meet their obligations; • the measures which the water undertaker intends to take or continue to manage and develop water resources so as to be able, and continue to be able, to meet its obligations; • the likely sequence and timing for implementing those measures; and • such other matters as the Secretary of State may specify in directions • A new plan must be produced every 5 years (Water Industry Act, 1991)
FWMA 2010	Southern Water must cooperate with other RMAs in the exercise of their flood risk management function and may share information with other RMAs for the purpose of discharging this duty. (FWMA Part 1 Section 13).
FRR 2009	Southern Water has a duty to cooperate with other authorities exercising their functions under the FRR. (FRR Part 6 Section 35).
	Southern Water must comply with a request of Medway Council to provide information reasonably required in connection with their responsibilities as LLFA under the FRR. (FRR Part 6 Section 36).

Roles and responsibilities of Lower Medway Internal Drainage Board

	Lower Medway IDB Flood Risk Management Functions
Land Drainage Act 1991	Medway IDB has a duty to exercise a general supervision over all matters relating to the drainage of land within their district.
	Medway IDB has powers to maintain existing works, that is to say, to cleanse, repair or otherwise maintain in a due state of efficiency any existing watercourse or drainage work.

	Lower Medway IDB Flood Risk Management Functions
	Medway IDB has powers to improve any existing works, that is to say, to deepen, widen, straighten or otherwise improve any existing watercourse or remove or alter mill dams, weirs or other obstructions to watercourses, or raise, widen or otherwise improve any existing drainage work.
	Medway IDB has powers to construct new works, that is to say, to make any new watercourse or drainage work or erect any machinery or do any other act required for the drainage of any land.
	If any person is liable to do any work in relation to any watercourse, bridge or drainage work (whether by way of repair, maintenance or otherwise); and fails to do the work, the drainage board concerned may serve a notice on that person requiring him to do the necessary work with all reasonable and proper despatch.
	Medway IDB may control development which affects watercourses within the Internal Drainage District by the use of application based consenting. • No person shall erect any mill dam, weir or other like obstruction to the flow of any ordinary watercourse or raise or otherwise alter any such obstruction; or erect any culvert that would be likely to affect the flow of any ordinary watercourse or alter any culvert in a manner that would be likely to affect any such flow, without the consent in writing of the drainage board concerned. • Where any ordinary watercourse is in such a condition that the proper flow of water is impeded, then, unless the condition is attributable to subsidence due to mining operations (including brine pumping), the drainage board or local authority concerned may require that the land or waterway owner remedy's that condition.
Flood and Water Management Act 2010	Medway IBD must cooperate with other RMAs in the exercise of their flood risk management function and may share information with other RMAs for the purpose of discharging this duty. (FWMA Part 1 Section 13).
	Medway IDB must aim to make a contribution towards the achievement of sustainable development when exercising a flood risk management function. (FWMA Part 1 Section 27).

	Lower Medway IDB Flood Risk Management Functions
	Medway IDB has powers to designate structures and features that affect flooding in order to safeguard assets that are relied upon for flood risk management. Once a feature is designated, the owner must seek consent from the authority to alter, remove or replace it. (FWMA Schedule 1 Section 1).
	Medway IDB has powers to undertake works to manage flood risk from surface water or groundwater, consistent with this strategy for their area. (FWMA Schedule 2 Section 29).
FRR 2009	Medway IDB has a duty to cooperate with other authorities exercising their functions under the FRR. (FRR Part 6 Section 35).
	Medway IDB must comply with a request of Medway Council to provide information reasonably required in connection with their responsibilities as LLFA under the FRR. (FRR Part 6 Section 36).

Appendix 2

Local Flood Risk Management Strategy Strategic Environmental Assessment Screening Report (draft).

January 2014

Document control:

Version	Status	Issue Date	Prepared by	Approved by
1	Draft	January 2014	Priscilla Mumby Flood Risk Management Officer	
2	Final			

Contents

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1 Introduction

1.1 This screening report is designed to determine whether or not the contents of the Medway Local Flood Risk Management Strategy (LFRMS) requires a Strategic Environmental Assessment (SEA) in accordance with the European Directive 2001/42/EC and associated Environmental Assessment of Plans and Programmes Regulations 2004 and Environmental Impact Assessment Directive (EIA) 85/337/EEC.

1.2 The purpose of the Medway LFRMS is to set outline Medway Council's approach, as a Lead Local Flood Authority (LLFA) to local flood risk management and record how this has been developed and agreed.

1.3 The legislative background set out below outlines the regulations that require the need for this screening exercise. Section 4, provides a screening assessment of the likely significant environmental effects of the LFRMS and considers the need for a full SEA.

2 Legislative Background

2.1 The basis for Strategic Environmental Assessment and Sustainability Appraisal legislation is European Directive 2001/42/EC. This was transposed into English law by the Environmental Assessment of Plans and Programmes Regulations 2004, or SEA Regulations. Detailed Guidance of these regulations can be found in the Government publication 'A Practical Guide to the Strategic Environmental Assessment Directive' (ODPM 2005).

2.2 Under Article 3(3) and 3(4) of the Directive, environmental assessment is required for certain categories of plans and programmes – only where they are deemed to be likely to have significant environmental effects.

Plans and programmes in these categories are:

- Plans and programmes of the types listed in Article 3(2), which determine the use of small areas at local level, or which are minor modifications to plans and programmes;

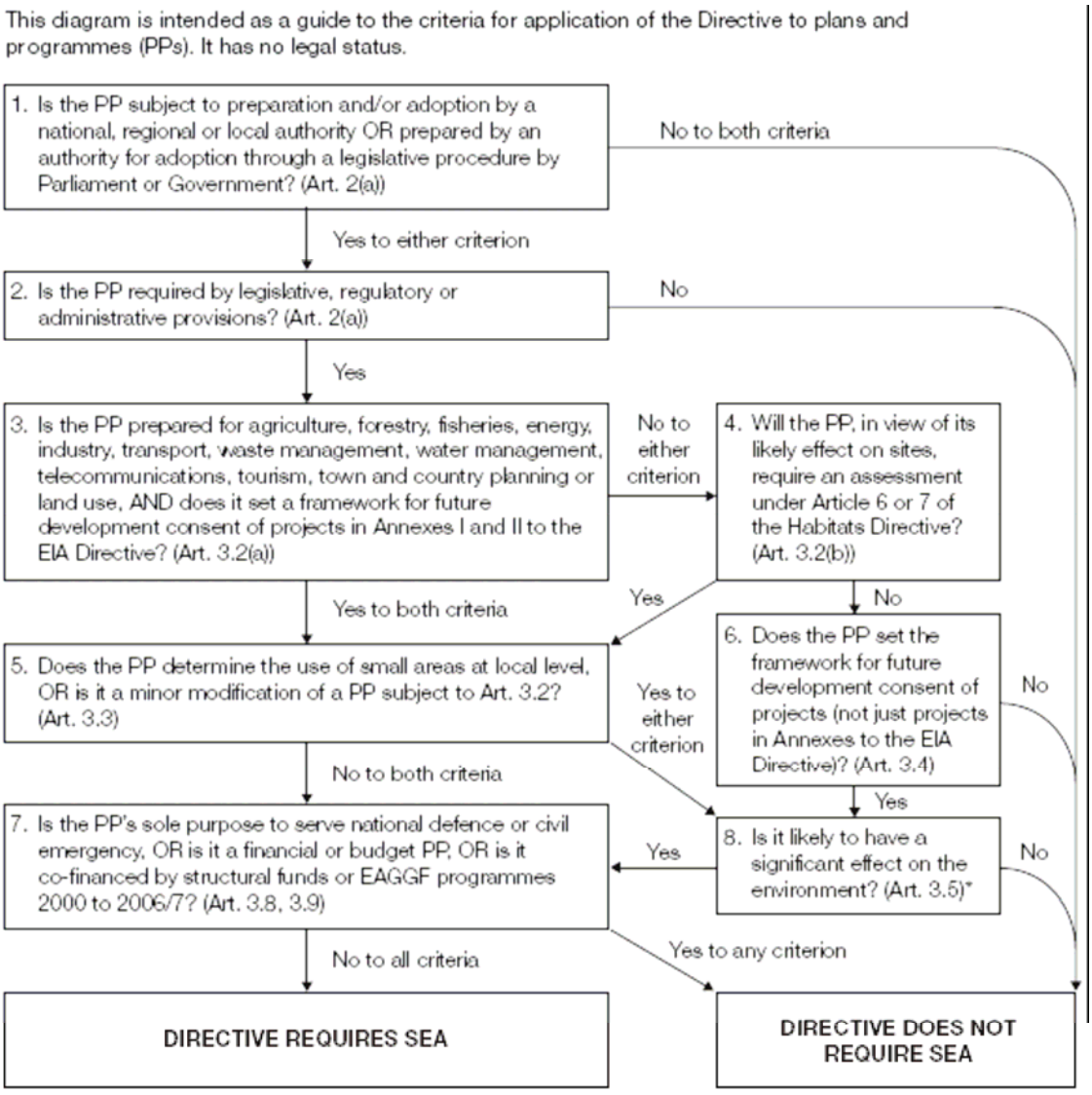
- Plans and programmes of types that are not listed in Article 3(2), which set the framework for future development consent of projects (not limited to projects listed in the Annexes to the EIA Directive).

2.3 The Directive does not prescribe who is to carry out an SEA, but normally it is the task of the Responsible Authority, i.e. the body that prepares and/or adopts the plan or programme.

2.4 This report focuses on screening for SEA and the criteria for establishing whether a full assessment is needed.

3 Screening Process

3.1 The diagram below illustrates the process for screening a planning document to ascertain whether a full SEA is required:



Source: A Practical Guide to the Strategic Environmental Assessment Directive (ODPM 2005)

3.2 The table below shows the assessment of whether the LFRMS will require a full SEA. The questions below are drawn from the diagram above which sets out how the SEA Directive should be applied.

Stage	Y/N	Reason
1. Is the PP (plan or programme) subject to preparation and/or adoption by a national, regional or local authority OR prepared by an authority for adoption through a legislative procedure by Parliament or Government? (Art. 2(a))	Y	The LFRMS is prepared by Medway Council for adoption at a local level.
2. Is the PP required by legislative, regulatory or administrative provisions? (Art. 2(a))	Y	Required under the Flood and Water Management Act 2010.
3. Is the PP prepared for agriculture, forestry, fisheries, energy, industry, transport, waste management, water management, telecommunications, tourism, town and country planning or land use, AND does it set a framework for future development consent of projects in Annexes I and II to the EIA Directive? (Art 3.2(a))	N	The LFRMS addresses the principles, via objectives of local flood risk management/water level management but does not set a framework applicable for *specifically identified* future development projects such as 'urban development projects' or 'land drainage projects' or 'dams and other installations designed to hold water or store it on a long term basis' or other types of projects identified under Annexes I or II of the EIA Directive.
4. Will the PP, in view of its likely effect on sites, require an assessment for future development under Article 6 or 7 of the Habitats Directive? (Art. 3.2 (b))	N	It is concluded that no significant effects on the European sites would occur (either individually or in-combination with other plans) as a result of delivering the objectives and measures defined in the LFRMS because of the

		generic nature of those objectives and measures.
5. Does the PP Determine the use of small areas at local level, OR is it a minor modification of a PP subject to Art. 3.2? (Art. 3.3)	N	The LFRMS does not determine the use of land or allocate land or identify sites for housing. It is not a minor modification of PP.
6. Does the PP set the framework for future development consent of projects (not just projects in annexes to the EIA Directive)? (Art 3.4)	N	Although the LFRMS may influence development decisions, it does not set the framework. The overarching framework is set by Core Strategy and Local Plan policies.
7. Is the PP's sole purpose to serve the national defence or civil emergency, OR is it a financial or budget PP, OR is it co-financed by structural funds or EAGGF programmes 2000 to 2006/7? (Art 3.8, 3.9)	N	Neither criterion applies.
8. Is it likely to have a significant effect on the environment? (Art. 3.5)		Refer to the table in section 4.

4 Criteria for assessing significant environmental effects.

4.1 Criteria for determining the likely significance of effects referred to in Article 3(5) of Directive 2001/42/EC are set out below in 4.3.

4.2 Measurement of impacts

The Directive does not advise a measurement methodology for the screening criteria included within Annex II. For the purposes of this screening exercise three simple measurements have been proposed to describe the impacts of the LFRMS.

Uncertain.

No predicted significant effects.

Potential positive significant effects.

Potential negative significant effects.

4.3 Screening criteria from Annex II (1)

4.3.1 The characteristics of plans and programmes having regard in particular to: -

SEA Directive Criteria	Impact	Reason
The degree to which the plan or programme sets a framework for projects and other activities, either with regard to the location, nature, size and operating conditions or by allocating resources.	No predicted significant effects.	The LFRMS does not allocate land, specify land uses, or identify sites for development. The LFRMS is provided in the form of general principles that are non-site or area specific. The LFRMS will provide guidance on existing policies that set the broad framework but does not extend or broaden the application or purpose of the parent policies.
The degree to which the plan or programme influences other plans and programmes including those in a hierarchy.	No predicted significant effects.	The LFRMS is loosely symbiotic with other plans and programmes but has less material weight. It does not require the introduction of new policies into higher order plans.

The relevance of the plan or programme for the integration of environmental considerations in particular with a view to promoting sustainable development.	Potential positive significant effects.	The LFRMS encourages development proposals to incorporate sustainable concepts within the design of developments to help reduce the environmental impact of flood risk and flooding. These objectives are enshrined in national guidance. The LFRMS sets objectives on how this can be achieved at a local level.
Environmental problems relevant to the plan or programme.	No predicted significant effects.	The LFRMS addresses the problem of flood risk
The relevance of the plan or programme for the implementation of Community legislation on the environment (e.g. plans and programmes linked to waste management or water protection)	No predicted significant effects.	LFRMS is unlikely to be significantly or directly applicable to this criterion due to its strategic nature.

4.3.2 Characteristics of the effects and of the area likely to be affected, having particular regard to the:

The probability, duration, frequency, and reversibility of the effects;	The overall medium to long-term environmental outcome is expected to be a gradual enhancement to the quality and character of the built environment via a reduction in flood risk. This effect is not considered to be significant in its magnitude and does not go beyond national and local policy frameworks.
Cumulative nature of the effects.	Gradual delivery of better designed more sustainable environments over the life of the strategy period. Although this effect should be positive, it is not considered to be significant in its magnitude and does not go beyond national and local policy frameworks.
Transboundary nature of the effects.	No transboundary effects beyond this boundary will occur.
Risks to human health or the environment.	No obvious risks have been identified.
Magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected.	The spatial coverage of the strategy will be confined to the local authority area. Any influence will be at a local level and any cumulative effects will be moderate and positive. The strategy will be delivered in the form of general objectives and principles to manage local flood risk at a strategic level. The strategy itself is not site-specific, nor does it set alternative approaches to different spatial areas. The strategy does not allocate land, specify land uses or identify sites for development.

Value and vulnerability of the area likely to be affected due to – special natural characteristics or cultural heritage, exceeded environmental quality standards, or limit values or intensive land use.	The strategy does not allocate land, specify land uses or identify sites for development. By promoting consideration of environmental context and better quality design it is not considered that the strategy is likely to have a significant effect on these considerations beyond those required of 'parent' policies. The SPD/guidance encourages consideration of variable density according to the scale and context of the development, creating areas of character, supporting the viability of local services and the landscape setting of the area
The effects on areas or landscapes, which have a recognised national, Community or international protection status.	Many areas within Medway contain areas of National and European significance including Sites of Special Scientific Interest (SSSI), Ramsar and Special Protection Areas (SPA). Although these are within Medway Council's jurisdiction for planning purposes, they will not be influenced by the strategy. It would not increase the amount of development that would take place within any given area, which is addressed through the Local Plan.

5 Screening Outcome

5.1 As a result of the assessment in section 4, it is deemed unlikely there will be any significant environmental effects arising from the LFRMS. Therefore, it is deemed that a full SEA does not need to be undertaken.

6 Consultation

6.1 The Responsible Authority must make its conclusions on a determination available to the public, including reasons for not requiring a SEA. The SEA Regulations also detail publicity requirements for determinations and make provision for a direction by the Secretary of State or devolved Ministers.

6.2 When forming a view on whether SEA is needed in these cases, Responsible Authorities must consult the Consultation Bodies.
The designated Consultation Bodies in England are:

- Natural England.
- Environment Agency.
- English Heritage.

6.3 The Directive defines “the public” as “one or more natural or legal persons, and in accordance with national legislation or practice, their associations, organizations or groups” (Article 2 (d)). The public to be consulted includes, but is not limited to “the public affected or likely to be affected by, or having an interest in (a plan or programme) including relevant non-governmental organisations (Article 6(4)).

6.4 This screening report will be provided for public consultation alongside the LFRMS and the relevant bodies consulted.

References:

A Practical Guide to the Strategic Environmental Assessment Directive. OODPM EC/2001/42/EC

EIA Directive 85/337 EEC as amended by 97/11/EC and 2003/35/EC

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