

REGENERATION, COMMUNITY AND CULTURE OVERVIEW AND SCRUTINY

16 JUNE 2011

FLOOD AND WATER MANAGEMENT ACT – PRELIMINARY FLOOD RISK ASSESSMENT FOR MEDWAY

Report from: Robin Cooper – Director Regeneration, Community and Culture

Author: Ian Wilson – Head of Capital Projects, Road Safety & Networks

Summary

This report summarises the Preliminary Flood Risk Assessment and issues arising from it as required by the Flood and Water Management Act. The background to the requirements of the Act was reported on 21 January 2011 and a copy of the Assessment is attached to the report for Members consideration.

1. Budget and Policy Framework

- 1.1 The Flood and Water Management Act (FWMA) established Medway Council as a Lead Local Flood Authority (LLFA). The Flood Risk Regulations 2009 impose a duty on the Council to prepare and publish a Preliminary Flood Risk Assessment.(PFRA) identifying 'significant' flood risk areas. Significant is to be defined by the Council.
- 1.2 The Regulations originally required the Council to submit the PFRA to the Environment Agency (EA) for comment by 22 June 2011. However, because it would have been very difficult for those authorities with elections in May to achieve this deadline, this requirement has been modified to require only a draft.

2. Background

- 2.1 The background to the FWMA and Regulations was set out in the previous report on 21 January. Since that date the data and mapping provided by the EA has been assessed, as has all other available information. From this information the preliminary assessment has

been carried out using the proposed definition of 'significant flood risk' which is explained further below.

3. Significant Flood Risk

- 3.1 There is some information available about historic flooding but, regrettably, the quality of the information is insufficient for firm conclusions to be drawn. In large part the problem with the information is that it was not collected for this particular purpose, and much of it is in different formats and with different levels of detail.
- 3.2 The Regulations provide for LLFAs to establish their own definition of 'significant flood risk'. Obviously significant can be highly subjective in terms of definition and to a single property owner flooding of that property is significant. However the guidance is clear that significance should be related to critical infrastructure and risk to life and property. This is dealt with further in the report.
- 3.3 The Flood Risk Regulations require Lead Local Flood Authorities to identify significant Flood Risk Areas on the basis of guidance to be issued by the Secretary of State in England. Flood Risk Areas need to be meaningful areas that require flood hazard and flood risk mapping, and management through flood risk management plans. Once the PRFA has been approved, the next stage will be to develop Flood Risk Management plans. Priority would obviously be given to those areas where there is a significant risk but there is still a requirement to investigate incidents of flooding and work with the appropriate risk authority to prevent or mitigate.
- 3.4 The guidance suggests that key indicators of significant risk are:-
- Human Health – A number of residential properties
 - Critical Services – Hospitals, Fire or Ambulance stations etc.
 - Economic Activity – Length of road or rail of strategic importance or extent of agricultural land
 - Environment – Designated sites? (SSSIs, SPAs etc.) and BAP Habitat (biodiversity area listed nationally).
- 3.5 All LLFAs are considering the appropriate definition. Medway is working with other authorities in the South East of England to look at the potential for a common approach. However there is some debate about whether it should be a fixed and specific measure or whether it should take account of frequency. It has been suggested by the Environment Agency that the threshold should be an order of magnitude below the significance criteria for determining flood risk areas. They also recommend that, as a minimum, it should involve flooding of a number of properties, on more than one occasion. The current working definition within the South East group is set out below:-

Definition of Significant Harmful Consequence

For the purpose of reporting past floods, a flood is deemed significant if it:

- 1) caused internal flooding to five or more residential properties, or
- 2) flooded two or more business premises, or
- 3) flooded one or more items of critical infrastructure, or
- 4) caused a transport link to be totally impassable for a significant period.

The definition of “significant period” is dependant on the transport link affected as follows (Highway categories are as set out in Table 1 of the UKRLG Code of Practice for Highway Maintenance).

- Category 1 highways (motorways) and major rail links – 2 hours or more
- Category 2 and 3a highways and other railway links – 4 hours or more
- Category 3b and 4a highways – 10 hours or more
- Category 4b highways – 24 hours or more

Reasoning

The reasoning behind these criteria is as follows.

- Defra set a threshold of 200 persons or 20 businesses per km grid square flooded to a depth of 300mm during a 1 in 100 flood
- An order of magnitude less can be considered as 20 persons, which would average 8.5 properties (based on a national occupancy rate of 2.34 persons per property)
- The number of business premises has not been reduced beyond two (the order of magnitude suggested by the EA), as this would have reduced the threshold to 1, which could result in very isolated, minor flooding being considered significant
- Using the km square grouping criterion of 30,000 persons an order of magnitude less would result in a threshold of 3,000 persons or 1,300 properties and for Medway would give no significant past events. This is not considered appropriate
- The 2-hour period for closure of a motorway or a major railway link is based on a figure suggested by a Highways Agency representative for all parts of the trunk road and motorway network
- The 4-hour period for closure of a category 2 or 3a highway or other railway link equates to an event affecting one peak period in a working day. (08.00 to 18.00)
- The 10-hour period for closure of a category 3b or 4a highway equates to an event affecting both peak periods in a working day. (08.00 to 18.00)
- The 24-hour period for closure of a category 4b highway equates to an event cutting off small numbers of properties and impacting some rural businesses

- The difference between major and other rail links has not been specified to avoid being too prescriptive. It is likely that major rail links will have twin tracks carrying several trains per hour in each direction, a number of which will be “through trains” (not stopping at minor stations). The format has been retained for reasons of consistency of approach but, in essence the lines to and from London would be major and the Medway Valley Line ‘other’.
- 3.6 The argument for inclusion of frequency within the definition is that it will then take account of repeated small incidents. The counter argument is that this would still not require a strategic response and is therefore inappropriate in a strategic document. As will be noted later, the proposed plan would take frequent ‘minor’ floods into account through the investigation and recording of the incidents which could then be addressed through the proposed Flood Board. For this reason it is suggested that the definition be accepted as a working definition for the purpose of this iteration of the plan. The plan is to be reviewed every three years and there will, therefore, be ample opportunity to refine the definition if necessary.

4. Data Quality

- 4.1 Although a wide range of sources have been considered as records of flooding, the quality of the information is poor and highly inconsistent. In most cases the information provided was collected for different purposes and is therefore recorded in different ways. Some authorities have sought memory information from residents. However, whilst this has generated a lot of reports, the information actually provided is understandably very limited. In order to properly understand risk from past events it is essential to have a specific date, indication of depth and the source. In many cases this is not present and the gathering and processing of such reports has proved unhelpful.
- 4.2 The mapping produced by the EA is very helpful in identifying potential problems but does not accurately reflect the records that we have. In most cases it appears to underestimate the drainage run-off through the road and surface water drainage systems and is therefore considered only as a worst case.
- 4.3 The mapping from EA has been produced on a national scale and it is not surprising that it may not fully reflect the local position. The main risk of flooding in Medway comes from tidal flooding moving up river. This risk is not covered in the report as responsibility for assessing that risk rests with the EA. However, when reviewing the maps it is clear that it would be an over-simplification to merely remove the EA areas of responsibility from the report and pass on all risk. There is a risk of flooding from sources other than the main river, which occurs because the outfalls are tide locked. Under the Act Medway remains responsible for investigating such incidents and risks.
- 4.4 For these reasons the general approach taken in the report is that the currently available information is helpful as a starting point but that the

information is not sufficiently robust to use for accurate assessment of risk, nor for decisions as to response and future planning. The key element of the report is to set out how accurate and robust information will be gathered in the future and used to inform further development of flood risk plans.

5. Next Steps

- 5.1 Further mapping of information provided by different authorities will be undertaken. Information from other sources will also be gathered. It is proposed to have a standard form for flood reporting. This format is to be standardised across the region so will be the same for any authority or report. Ideally this will be an internet based report. It is accepted that all desirable information may not be provided each time, but the format will at least be consistent and the gaps in information will be clear. Essentially they will act as a notification for the Council to further investigate where appropriate.
- 5.2 It is also proposed to establish a local Flood Board. This Board will act as a forum for the bodies, which are considered to have significant flood risk responsibilities either through statute or through their ownership of assets. Clearly the EA, Southern Water, Lower Medway Internal Drainage Board as well as the Council will be the core members. The Board will consider reports of incidents and establish the appropriate responsible organisation.
- 5.3 The Act requires the LLFA to publish any reports of investigations into flooding incidents and it is again anticipated that this will be done through the Council website.
- 5.4 Members are asked to comment on the draft Report attached which will then be included in the submission to the EA. There may be comments from the EA, which will then be included in a 'final' version for review by Members and report to Cabinet.
- 5.5 The Report is to be seen as a living document and the approach taken is that much more comprehensive and robust information must be gathered from many sources in order to enable the production of a Flood Risk Management Plan for Medway.

6. Risk Management

Risk	Description	Action to avoid or mitigate risk
Failure to submit Report	If the draft report is not submitted the EA can procure one independently of the Council and recover the costs from the Council	The draft report is prepared and will be submitted together with any Member comments.

7. Financial and Legal Implications

7.1 Financial implications

Funding has been provided for the preparation of the Report and the Flood Risk Management Plans. Information from DEFRA is that there will be annual funding for the new responsibilities.

7.2 Legal implications

There are no specific legal implications in the report.

8. Recommendation

- 8.1 The Committee is asked to consider the report and make comments prior to its submission as a draft to the Environment Agency.

Lead officer contact:

Ian Wilson, Capital Projects, Road Safety and Networks Manager
Tel. No: 01634 331543 Email: ian.wilson@medway.gov.uk

Background documents

Flood Risk Regulations 2009
Flood and Water Management Act 2010
UKRLG Code of Practice for Highway Maintenance

A copy of the technical Annexes used in this report can be available electronically by request.

Medway Council

Preliminary Flood Risk Assessment Report

Contents	Page
Executive Summary	3
1 Introduction	4
1.1 Preliminary Flood Risk Assessment	4
1.2 Study area	5
1.3 Aims and objectives	10
2 LLFA Responsibilities	10
2.1 Introduction	10
2.2 Co-ordination of Flood Risk Management	10
2.3 Stakeholder engagement	11
2.4 Public engagement	11
2.5 Further responsibilities	11
3 Methodology and data review	12
3.1 Introduction	12
3.2 Methodology	12
3.3 Data sources	13
3.4 Data limitations	15
3.5 Data restrictions and security	16
4 Historic flood risk	16
4.1 Overview of historic flooding in Medway	16
4.2 Definition of significant harmful consequence	17
4.3 Consequences of historic flooding	18
4.4 Maps of historic flood events	19
5 Future flood risk	22
5.1 Overview of future flood risk	22
5.2 Potential consequences of future flooding	31
5.3 Effect of climate change and long-term developments	33
6 Flood Risk Areas	35
6.1 Overview	35
7 Next steps	37
7.1 Future data management arrangements	37
7.2 Scrutiny and review procedures	37
References	39
Annex 1: Records of past floods and their significant consequences (Preliminary Assessment Spreadsheet)	40
Annex 2: Records of future floods and their significant consequences	40

(Preliminary Assessment Spreadsheet)

Annex 3: Records of Flood Risk Area and its rationale 40

(Preliminary Assessment Spreadsheet)

Annex 4: Review Checklist 40

Annex 5: Historic Flood Risk Data 40

Abbreviations

AStSWF	Areas Susceptible to Surface Water Flooding
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
EC	European Commission
FMfSW	Flood Map for Surface Water
FWMA	Flood & Water Management Act 2010
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
MoU	Memorandums of Understanding
PPS25	Planning and Policy Statement 25: Development and Flood Risk
PFRA	Preliminary Flood Risk Assessment
RBD	River Basin District
RFDC	Regional Flood Defence Committee
SAB	SuDS Approving Body
SFRA	Strategic Flood Risk Assessment
SLA	Service Level Agreement
SuDS	Sustainable Drainage Systems

Executive summary

This report has been prepared to assist Medway Council meet their duties to manage local flood risk and deliver the requirements of the Flood Risk Regulations (2009) and Flood and Water Management Act 2010. Medway Council, defined as a Lead Local Flood Authority (LLFA) under the Regulations, is a unitary authority.

The Preliminary Flood Risk Assessment (PFRA), comprising this document, the supporting spreadsheets represents the first stage of the requirements of the Regulations. The PFRA process is aimed at providing a high level overview of flood risk from local flood sources, including surface water, groundwater, ordinary watercourses and canals. As a LLFA, Medway Council must submit their PFRA to the Environment Agency for review by 22 June 2011. The methodology for producing this PFRA has been based on the Environment Agency's Final PFRA Guidance and Defra's Guidance on selecting Flood Risk Areas, both published in December 2010. The Environment Agency has used a national methodology, which has been set out by Defra, to identify indicative Flood Risk Areas across England. Of the ten indicative Flood Risk Areas that have been identified nationally, one is located within Medway Council's administrative area. Within this Flood Risk Area, the Regulations require Medway Council to carry out two subsequent key stages:

- flood hazard maps and flood risk maps; and
- flood risk management plans.

The Indicative Flood Risk Area, shown in Figure 6-1 of this report is situated across most of the Medway area.

In order to develop an understanding of the flood risk across Medway, flood risk data and records of historic flooding were collected from five different local and national sources including the Environment Agency, Southern Water, Kent Fire and Rescue Service and Medway Council Highways Services.

Information relating to nearly 400 flood events, caused by flooding from local sources, was collected and analysed. However, comprehensive details on flood extents and consequences of these events were largely unavailable. Based on the evidence that was collected, no past flood events were considered to have had 'significant harmful consequences'. Therefore, the decision was made to not include any records of past flooding in Annex 1 of the Preliminary Assessment Spreadsheet. It must be noted that there is a risk of flooding from local sources across Medway, particularly from surface water.

Author:
David Highley
Senior Project Planner
Capital Projects
Frontline Services
Medway Council

Tel.: 01634 331306
Email: david.highley@medway.gov.uk

1 Introduction

1.1 Preliminary Flood Risk Assessment

This document reports the findings of research undertaken by Medway Council towards the preparation of a Preliminary Flood Risk Assessment (PFRA) for its administrative area. The chief drivers behind this research and preparation of the PFRA report are two sets of new legislation: the Flood Risk Regulations (the Regulations), which came into force on the 10 December 2009, and the Flood & Water Management Act (FWMA) which gained Royal Assent on 8 April 2010. Under these pieces of legislation, all unitary authorities, including Medway Council and all county councils in two-tier systems, are designated a LLFA and have formally been allocated a number of key responsibilities with respect to local flood risk management. A full description of these responsibilities is provided in chapter 2.

The purpose of the Flood Risk Regulations was to transpose the EC Floods Directive (Directive 2007/60/EC on the assessment and management of flood risk) into domestic law in England and Wales and to implement its provisions. In particular it places duties on the Environment Agency and LLFAs to prepare a number of documents including:

- Preliminary Flood Risk Assessments;
- Flood Hazard and Flood Risk Maps;
- Flood Risk Management Plans.

Figure 1-1: Elements of work required under the Flood Risk

22 June 2011	Prepare Preliminary Assessment Report	<i>The PFRA should focus on local flood risk from surface water, groundwater, ordinary water courses and canals.</i>
22 June 2011	On the basis of the PFRA, identify Flood Risk Areas	<i>Flood Risk Areas are areas of significant risk identified on the of the findings of the PFRA, national criteria set by the UK Government Secretary of State and guidance provided by the Environment Agency.</i>
22 June 2013	Prepare Flood Hazard Maps and Flood Risk Maps for each Flood Risk Area	<i>Used to identify the level of hazard and risk of flooding within each Flood Risk Area to inform the Flood Risk Management Plans.</i>
22 June 2015	Prepare Flood Risk Management Plans for each Flood Risk Area	<i>Plans setting out risk management objectives and strategies for each Flood Risk Area.</i>

This PFRA considers past flooding and possible future flooding from the following local flood sources:

- surface water;
- groundwater;
- ordinary watercourses; and
- canals.

The PFRA report must consider floods, which have significant harmful consequences for human health, economic activity and the environment. Flooding associated with the sea and main rivers is the responsibility of the Environment Agency and does **not** need to be considered by the LLFA as part of the PFRA, unless it is considered that it may affect flooding from one of the sources listed above. A map of the Main River Line, detailing watercourses that fall under the responsibility of the Environment Agency is shown in Figure 1-3.

It is not the responsibility of Medway Council as LLFA to report on areas covered by Lower Medway Internal Drainage Board (LMIDB). A map showing their area of responsibility is included in Figure 1-4. LMIDB were consulted throughout this process, and will continue to be in all future flood risk exercises.

The Environment Agency's Detailed River Network map, Figure 1-5 shows all rivers and ordinary water courses within Medway. By deducting the Main River Line, and those watercourses that fall under the responsibility of LMIDB we can calculate ordinary watercourses for which Medway Council is responsible as LLFA. These watercourses are shown in Figure 5-5.

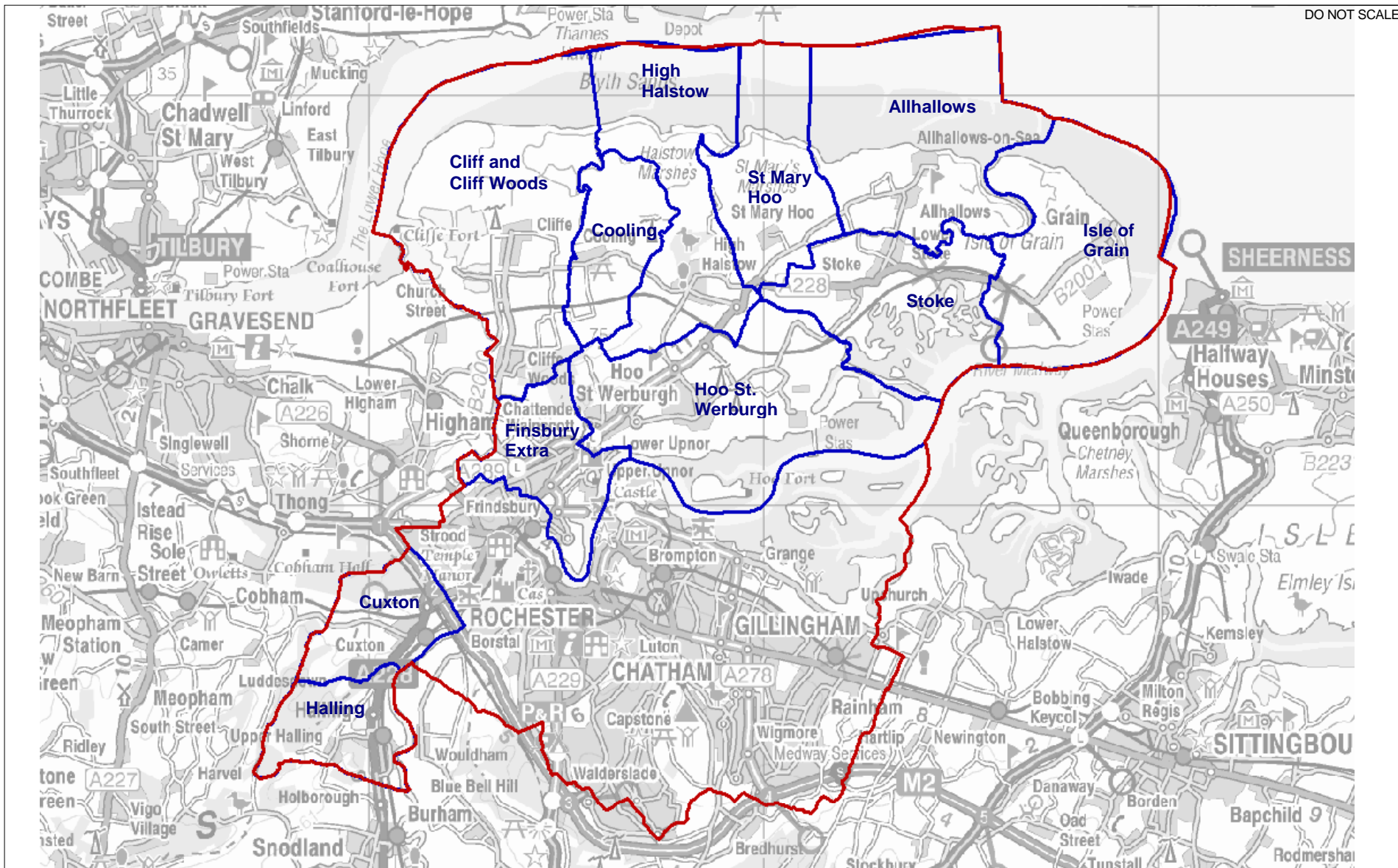
In the section regarding future flood risk a modelled map of surface water is used to show areas at risk from that source. This Environment Agency map has had the Main River Line and LMIDB water courses deducted, leaving a map of risk representative of Medway Council's ordinary water courses only.

A map showing flooding from this source, and an explanation of the methodology used to plot the data is included in section 5 of this report.

1.2 Study area

The area for this PFRA is defined by the administrative boundary of Medway Council. The area is divided into 11 parishes, all of which, along with Medway Council's administrative boundary are shown in Figure 1-2.

Medway Council is a unitary authority covering approximately a total area of 26,876 hectares. Of this 7511 hectares is water, and 19365 hectares land. The study area falls across the Thames River Basin District and is served by Southern Water and covered by the South East Environment Agency regional office.



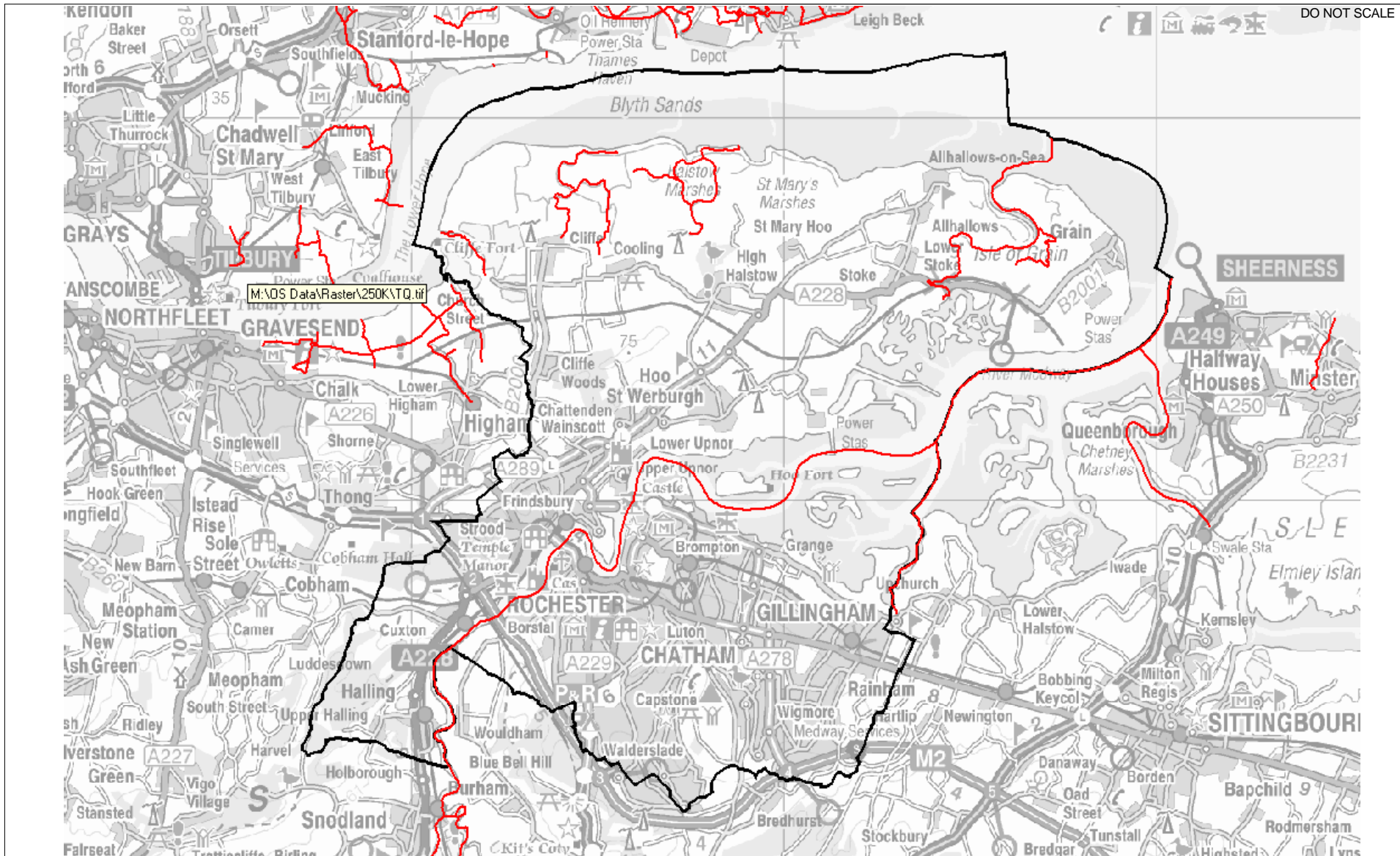
COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT. ME4 4TRU
 Tel. (01634) 306000

- Key
- Medway Boundary
 - Parish Boundaries

Title
Medway Boundary and Parishes
 Figure 1-2



DO NOT SCALE

COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011."

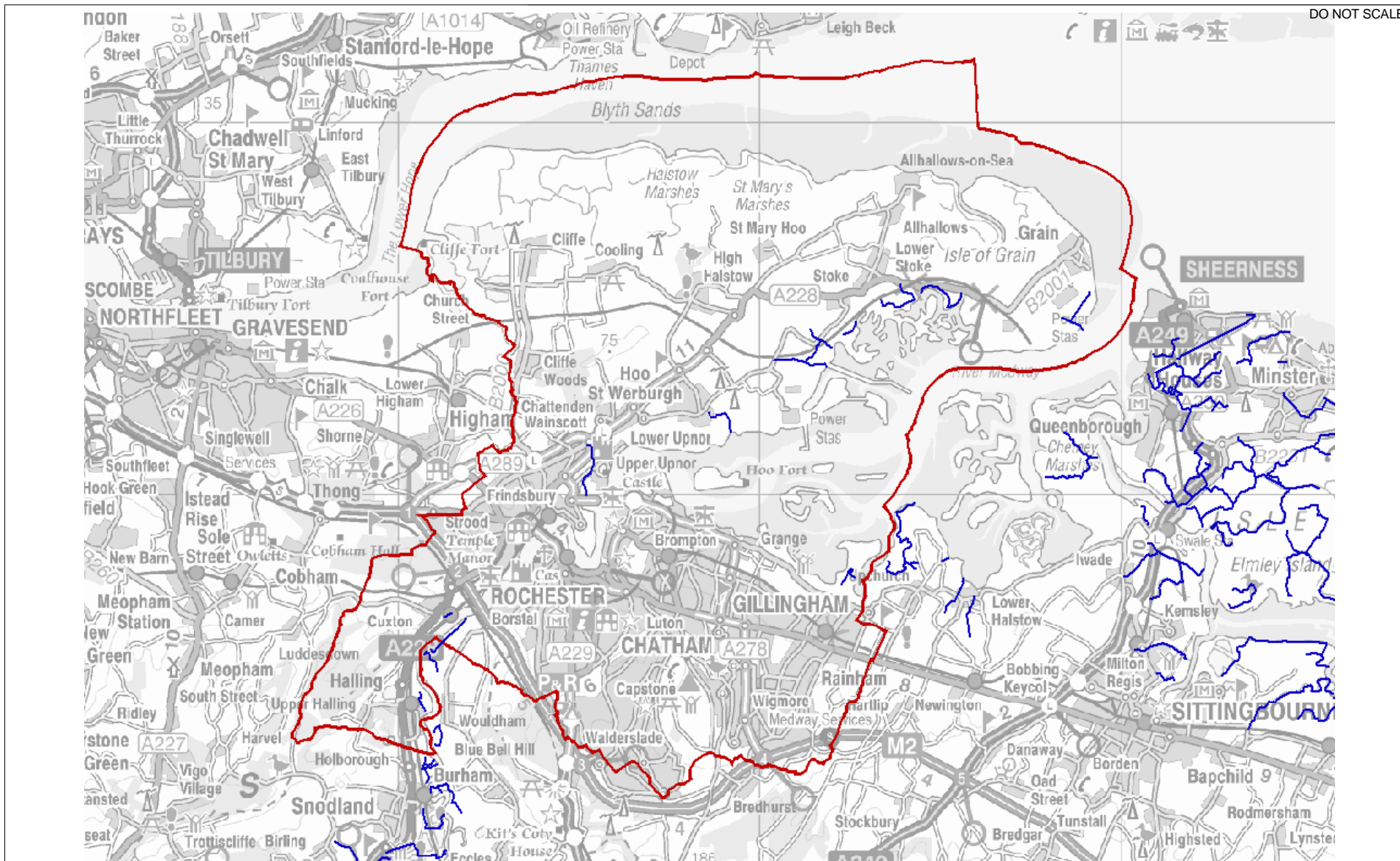


DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT, ME4 4TRU
 Tel. (01634) 306000

- Key
- Medway Boundary
 - Medway Main River Line

Title



Main Rivers in the Medway Area
Figure 1-3



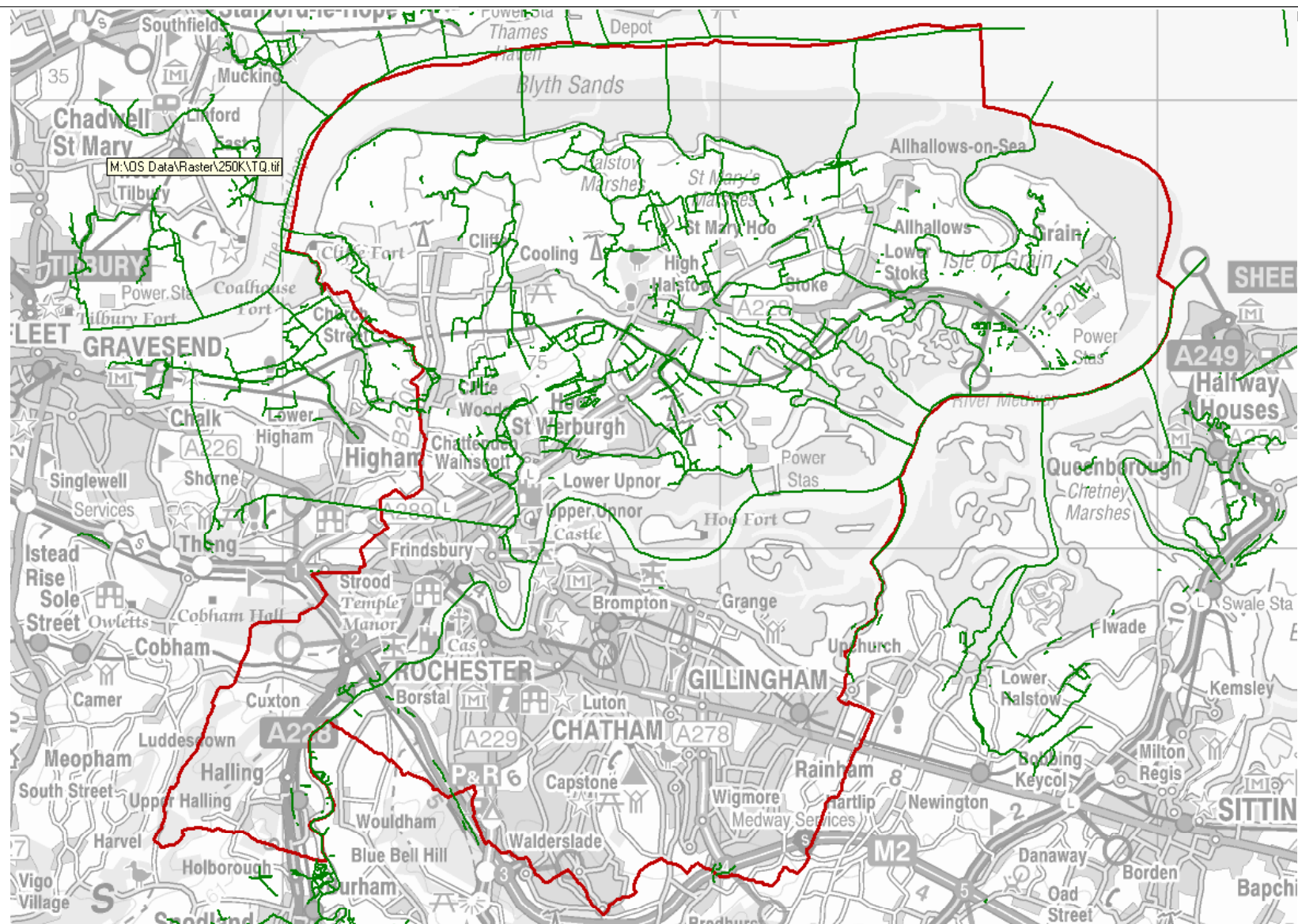
COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT. ME4 4TRU
 Tel. (01634) 306000

Key
 Medway Boundary
 LMIDB

Title
 Lower Medway
 Internal Drainage Board (LMIDB)
 Ordinary Water Courses
 Figure 1-4



COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011."



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT. ME4 4TRU
 Tel. (01634) 306000

- Key
- Medway Boundary
 - Detailed River Network

Title
Detailed River Network (DRN)
 Figure 1-5

1.3 Aims and objectives

The PFRA is a high level screening exercise to locate areas in which the risk of surface water and groundwater flooding is significant and warrants further examination through the production of maps and management plans. The aim of this PFRA is to provide an assessment of local flood risk across the study area, including information on past floods and the potential consequences of future floods. The key objectives can be summarised as follows:

- identify relevant partner organisations involved in future assessment of flood risk, and summarise means of future and ongoing stakeholder engagement;
- describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information;
- summarise the methodology adopted for the PFRA with respect to data sources, availability and review procedures;
- assess historic flood events within the study area from local sources of flooding (including flooding from surface water, groundwater, ordinary watercourses and canals) and the consequences and impacts of these events;
- establish an evidence base of historic flood risk information, which will be built up on in the future and used to support and inform the preparation of Medway's Local Flood Risk Strategy;
- assess the potential harmful consequences of future flood events within the study area;
- review the provisional national assessment of indicative Flood Risk Areas provided by the Environment Agency and provide explanation and justification for any amendments required to the Flood Risk Areas.

2 LLFA responsibilities

2.1 Introduction

The preparation of a PFRA is just one of several responsibilities of LLFAs under the new legislation. This section provides a brief overview of other responsibilities Medway Council is obliged to fulfil under their role as a LLFA.

2.2 Co-ordination of flood risk management

In his review of the summer 2007 flooding, Sir Michael Pitt stated “the role of local authorities should be enhanced so that they take on responsibility for leading the co-ordination of flood risk management in their areas”. As the designated LLFA, Medway Council is therefore responsible for leading local flood risk management across Medway. Much of the local knowledge and technical expertise necessary for Medway Council to fulfil their duties as LLFA lies within partner organisations. It is therefore crucial that Medway Council works alongside these groups and organisations as they undertake their responsibilities to ensure effective and consistent management of local flood risk throughout the county and to contribute to the provision of a coordinated and holistic approach to flood risk management across the study area. As Lead Local Flood Authority, it is the role of Medway Council to forge effective partnerships with Southern Water and the Environment Agency, as well as other key stakeholders. Ideally these working arrangements should be formalised to ensure clear lines of communication, mutual co-operation and management through the provision of Service Level Agreements (SLAs) or Memoranda of Understanding (MoU).

2.3 Stakeholder engagement

As part of the PFRA, Medway Council has sought to engage stakeholders representing the following organisations and authorities:

- **Lower Medway Internal Drainage Board**
- **Environment Agency**
- **Southern Water**
- **11 parish councils**
- **Kent Fire and Rescue Service**

It is important to note that we have communicated with and collated data from various department leads within Medway Council including the Highways and Drainage Departments.

2.4 Public engagement

It is recognised that members of the public may also have valuable information to contribute to the PFRA and to local flood risk management more generally across Medway. Public engagement can afford significant benefits to local flood risk management including building trust, gaining access to additional local knowledge and increasing the chances of acceptance of options and decisions proposed in future flood risk management plans. It is important to undertake some public engagement when formulating local flood risk management plans as this will help to inform future levels of public engagement. It is recommended that Medway Council follow the guidelines outlined in the Environment Agency's 'Building Trust with Communities' document, which provides a useful process of how to communicate risk including the causes, probability and consequences to the general public and professional forums such as local resilience forums.

2.5 Further responsibilities

Aside from forging partnerships and coordinating and leading on local flood management, there are a number of other key responsibilities that have arisen for Lead Local Flood Authorities from the Flood & Water Management Act and the Flood Risk Regulations. These responsibilities include:

- **Investigating flood incidents** – LLFAs 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 they 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.
- **Asset Register** – LLFAs also have a duty to maintain a register of structures or features, which are considered to have an effect on flood risk, including details on ownership and condition as a minimum. The register must be available for inspection and the secretary of state will be able to make regulations about the content of the register and records.
- **Sustainable Drainage Systems (SuDS) Approving Body** – LLFAs are designated the SuDS Approving Body (SAB) for any new drainage system, and therefore must approve, adopt and maintain any new SuDS within their area.
- **Local Strategy for Flood Risk Management** – LLFAs are required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategy will build upon information such as national risk assessments

and will use consistent risk based approaches across different local authority areas and catchments.

- **Works powers** – LLFAs have powers to undertake works to manage flood risk from surface runoff and groundwater, consistent with the local flood risk management strategy for the area.
- **Designation powers** – LLFAs, as well as district councils and the Environment Agency have powers to designate structures and features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management.

3 Methodology and data review

3.1 Introduction

The approach for producing this PFRA was based upon the Environment Agency's PFRA Final Guidance, which was released in December 2010. The PFRA is based on readily available or derivable data and with this in mind, the following methodology has been used to undertake the PFRA.

3.2 Methodology

Data collection from partner organisations

The following authorities and organisations were identified and contacted to share data for the preparation of the PFRA; Southern Water, the Environment Agency and Lower Medway Internal Drainage Board, Kent Fire and Rescue Service and Medway's 11 parish councils.

Assessing historic flood risk

Existing datasets, reports and anecdotal information from the stakeholders listed above were collated and reviewed to identify details of major past flood events and associated consequences including economic damage, environmental and cultural consequences and impact on the local population.

Assessing future flood risk

The identification of Flood Risk Areas through the PFRA should also take into account future floods, defined as any flood that could potentially occur in the future. This definition includes predicted floods extrapolated from current conditions in addition to those with an allowance for climate change. The assessment of future flood risk will primarily rely on a technical review of the Environment Agency's Flood Map for Surface Water, which has been recently circulated to Lead Local Flood Authorities. The Flood Map for Surface Water uses a numerical hydraulic model to predict the extent of flood risk from two rainfall events (1 in 30 annual chance and 1 in 200 annual chance). The following factors were considered when assessing future flood risk across the Medway study area; topography, location of ordinary watercourses, location of flood plains that retain water, characteristics of watercourses (lengths, modifications), effectiveness of any works constructed for the purpose of flood risk management, location of populated areas, areas in which economic activity is concentrated, the current and predicted impact of climate change and the predicted impact of any long-term developments that might affect the occurrence or significance of flooding, such as proposals for future development.

Identifying flood risk areas

Information regarding historic and future flood risk will be used to formally identify Flood Risk Areas. To achieve this, *flood risk indicators* will be used to determine the impacts of flooding on human health, economic activity, cultural heritage and the environment. The use of flood risk indicators helps to develop understanding of the impacts and consequences of flooding. Key flood risk indicators are summarised in Table 3-1.

Table 3-1: Key flood risk indicators

Impacts of flooding on:	Flood risk indicators
Human health	Number of residential properties. Critical services (Hospitals, Police/Fire/Ambulance stations, Schools, Nursing homes, etc).
Economic activity	Number of non-residential properties. Length of road or rail. Area of agricultural land.
Cultural heritage	Cultural heritage sites (World Heritage Sites).
Environment	Designated sites (SSSIs, SACs, SPAs, etc) and BAP habitat.

The above indicators have been selected and analysed by Defra and the Environment Agency in order to identify areas where flood risk and potential consequences exceed a pre-determined threshold. The areas that have been identified using this methodology and exceed 30,000 people at risk have been mapped and identified as Indicative Flood Risk Areas. For further details, please refer to Defra's Guidance for selecting and reviewing Flood Risk Areas for local sources of flooding (December 2010).

3.3 Data sources

Figure 3-2 catalogues the relevant information and datasets held by partner organizations and provides a description of each of the datasets.

Table 3-2: Relevant information and datasets

	Dataset	Description
Environment Agency	Areas Susceptible to Surface Water Flooding	The first generation national mapping, outlining areas of risk from surface water flooding across the country with three susceptibility bandings (less, intermediate and more).
	Flood Map for Surface Water	The updated (second generation) national surface water flood mapping which was released at the end of 2010. This dataset includes two flood events (with a 1 in 30 and a 1 in 200 chance of occurring) and two depth bandings (greater than 0.1m and greater than 0.3m).
	Flood Map	Shows the extent of flooding from the sea and all watercourses and rivers with a catchment of more than 3km ² from the sea.
	Areas Susceptible to Groundwater Flooding	Coarse scale national mapping showing areas which are susceptible to groundwater flooding.
	National Receptors Dataset	A national dataset of social, economic, environmental and cultural receptors including residential properties, schools, hospitals, transport infrastructure and electricity substations.
	Indicative Flood Risk Areas	Nationally identified flood risk areas, based on the definition of "significant" flood risk described by Defra.
	Historic Flood Map	Attributed spatial flood extent data for flooding from all sources.
	Detailed River Network (DRN)	A map of all watercourses above a given threshold in size
	Main River Line	Watercourses designated Main Rivers that are the responsibility of the EA
Parish councils	Anecdotal information relating to local flood history and flood risk areas	Anecdotal information from authority members regarding areas known to be susceptible to flooding from excessive surface water, groundwater or flooding from ordinary watercourses.
Medway Council	Highways flooding reports	Highways flooding reports for a number of locations within Medway
Kent Fire and Rescue Service	Historic flooding records	Records of historic flooding events from call out records including location, incident type and response given.
Lower Medway Internal Drainage Board	Historic flooding records	An anecdotal record of one historic flood event.
Southern Water	Historic flood records	Formal records of flood incidents as a consequence of precipitation 1987-2011.

3.4 Data limitations

A brief assessment of the data collection process is included in this chapter to provide transparency with respect to the methodology. By flagging up the issues identified in the data collection phase it is hoped this could serve as a catalyst to improve the collection of flood risk data going forward. A number of issues arose during the data collection process, as described below:

Inconsistent recording systems

The lack of a consistent historic flood data recording systems across partners has led to major inconsistencies in the recording of flood event data. This has resulted in incomplete, or sometimes nonexistent, historic flood record datasets.

Incomplete datasets

As a result of the lack of consistent historic flood data recording arrangements (as described above), many partners have kept poor flood records. Some of the datasets collated are not exhaustive and it is felt that they are unlikely to accurately represent the complete flood risk issues in a particular area. The corresponding gaps in flood data will hinder also the identification of accurate flood risk areas.

Varied quality of data

Although a wide range of sources have been considered as records of flooding, the quality of the information is poor and highly inconsistent. In most cases the information provided was collected for different purposes and is therefore recorded in different ways. Some authorities have sought memory information from residents. However, whilst this has generated a lot of reports, the information actually provided is understandably very limited. In order to properly understand risk from past events it is essential to have a specific date, indication of depth and the source. In many cases this is not present and the gathering and processing of such reports has proved unhelpful.

Based upon the data collected there was found to be varied quality in historic flood records and information. Data from Kent Fire and Rescue Service for instance was of insufficient quality to be of use. Although events were recorded with dates and geo-reference details the record of flooding was not specific enough to determine the cause. Kent Fire and Rescue Service policy restricts the recording of events to a nationally imposed coding system. A free text field records some details of flooding, though no current system requires telephone operators to record the source of flooding. Even if a source of flooding is given data cannot be fully relied upon as would normally come from a non-expert source, i.e. a member of the public.

Southern Water data is geo-referenced by post code. Although more accurate geographic details are available it was felt by Southern Water that specifying locations to the extent where a specific property is identifiable may blight the reputation and therefore value of that property. Flood events are therefore mapped to the post code centre point. Although this method is inherently inaccurate it will still prove useful in assessing the density of flood events across Medway. Some flood events were duplicated, and some post codes incorrect and untraceable. These were disregarded for the purposes of mapping.

Data was requested from the 11 local parish councils. They had no formal records of localised flooding and were not able to provide anecdotal data in the timeframe given.

All collected data is represented in the following map. Data from Kent Fire and Rescue is, as earlier stated, of insufficient quality to be used in this exercise.

Future Flood Group meetings will discuss such issues and construct a communications strategy that will modify current recording practices taking into account the nationally imposed recording restrictions that, as shown in the above example, some stakeholders are held to.

Although Kent Fire and Rescue data has been included in the historic flood event data set in Annex 5 of this report it has not been mapped for the reasons given above.

Records of consequences of flooding

No data providers were able to provide comprehensive details of the consequences of specific past flood events, which made accurately assessing the consequences of historic flooding impossible.

3.5 Data restrictions and security

In collating flood event data it was asked that Medway Council sign a data protocol agreement with Southern Water. This restricted the circulation of Southern Water data to Medway Council and The Environment Agency.

4 Historic flood risk

4.1 Overview of historic flooding in Medway

Records of historical flood events and flooding hotspots were collected across Medway Council's administrative area. Maps highlighting the locations of these past flood events are illustrated in Figures 4-2 and 4.3. A summary of information specific to each source of flooding considered as part of the PFRA is included below.

Surface water flooding

Surface water flooding occurs when heavy rainfall exceeds the capacity of local drainage networks and water flows across the ground.

Groundwater flooding

Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from abnormal springs. This tends to occur after long periods of sustained high 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 major aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels.

Sewer flooding

Sewer flooding is a consequence of rainwater inundation temporarily exceeding the capacity of the sewer network. Southern Water provided data relating to over 360 incidents of flooding from precipitation. The critical element in assessing the risk will be the intensity of the storm that gave rise to the precipitation. This is not available within the current data set. However the records will be mapped and will form the basis for future assessments and comparisons.

Ordinary watercourse flooding

Ordinary watercourse flooding is caused when surface water inundation exceeds the capacity of the watercourse network as a result of precipitation, or as a result of blocked outflow to the sea and river at high tide, as described in the section below. Some ordinary watercourses in Medway are the responsibility of Medway Council (shown in Figure 1-6), some of of Lower Medway Internal Drainage Board.

The Lower Medway Internal Drainage Board formally reported only one event. The Board indicated a significant amount of anecdotal and informally recorded incidents of historic flooding, but was unable to communicate such incidents on the timeframe given. The single event reported was from sea water flooding and therefore was not included in the map of Historic Flood Events.

Medway Council's Highways department Drainage Engineers reported 23 incidents of flooding, or areas historically susceptible to flooding that were predominantly from issues relating to ordinary course drainage.

Interaction with main rivers and the sea

There is evidence to show that the interaction between the Thames Estuary at high tide and the surface water drainage system to the north of the Hoo Peninsula causes localised flooding. During period of heavy rainfall surface water that cannot discharge through flap valves that are closed by high river water.

4.2 Definition of signifant harmful consequence

National guidance issued by Defra sets thresholds for defining areas where the flood is significant. No guidance has been issued for defining locally significant harmful consequences and it is up to each LLFA to set its own definition. It has been suggested by the Environment Agency that the threshold should be an order of magnitude below the significance criteria for determining flood risk areas. They also recommend that, as a minimum, it should involve flooding of a number of properties, on more than one occasion.

It should be noted that "significant harmful consequence" has been defined here by Medway Council for the purposes of this reporting exercise. This definition differs from that used by the EA, shown in Figure 5-7 that was used to initially identify areas above the flood risk threshold.

Definition

For the purpose of reporting past floods, Medway Council has defined a flood as significant if it:

- caused internal flooding to five or more residential properties; or
- flooded two or more business premises; or
- flooded one or more items of critical infrastructure; or
- caused a transport link to be totally impassable for a significant period.

The definition of significant period is dependant on the transport link affected as follows (Highway categories are as set out in Table 1 of the UKRLG Code of Practice for Highway Maintenance).

- Category 1 highways (motorways) and major rail links – 2 hours or more.
- Category 2 and 3a highways and other railway links – 4 hours or more.
- Category 3b and 4a highways – 10 hours or more.
- Category 4b highways – 24 hours or more.

Reasoning

The reasoning behind these criteria is as follows:

- Defra set a threshold of 200 persons or 20 businesses per km grid square flooded to a depth of 300mm during a 1 in 100 flood.
- An order of magnitude less can be considered as 20 persons, which would average 8.5 properties (based on a national occupancy rate of 2.34 persons per property).
- The number of business premises has not been reduced beyond two (the order of magnitude suggested by the EA), as this would have reduced the threshold to 1, which could result in very isolated, minor flooding being considered significant.
- Using the km square grouping criterion of 30,000 persons an order of magnitude less would result in a threshold of 3,000 persons or 1,300 properties and for Medway would give no significant past events. This is not considered appropriate.
- The 2-hour period for closure of a motorway or a major railway link is based on a figure suggested by a Highways Agency representative for all parts of the trunk road and motorway network.
- The 4-hour period for closure of a category 2 or 3a highway or other railway link equates to an event affecting one peak period in a working day (8am to 6pm).
- The 10-hour period for closure of a category 3b or 4a highway equates to an event affecting both peak periods in a working day (8am to 6pm).
- The 24-hour period for closure of a category 4b highway equates to an event cutting off small numbers of properties and impacting some rural businesses.
- The difference between major and other rail links has not been specified to avoid being too prescriptive. It is likely that major rail links will have twin tracks carrying several trains per hour in each direction, a number of which will be “through trains” (not stopping at minor stations).

4.3 Consequences of historic flooding

As a result of the issues discussed in chapter 3.4, insufficient data is available to draw definitive conclusions on the impacts and consequences of historic flood events on people, the economy and the environment, as this information has not been recorded in the past.

Due to the lack of accurate and consistent information available, no historic flood events have been considered to have had significant harmful consequences, and therefore none will be recorded in Annex 1 of the Preliminary Assessment Spreadsheet. However, a complete record of locations where flooding has occurred will be kept by Medway Council as a future evidence base. This base will be built up in the future through ensuring full details of flood events are recorded; this will then be used to support and inform future PFRA cycles as well as Medway’s Local Flood Risk Management Strategy.

A table showing the data collected from Medway Council’s Highways Department, Lower Medway Internal Drainage Board and Southern Water is included in Annex 5 of this report.

4.4 Maps of historic flood events

The maps that follow have been plotted using some of the data sets detailed in Annex 5 of this report. Of the data collected only the following data sets were considered of sufficient quality to be of any use in this exercise

Medway Council Highways Department

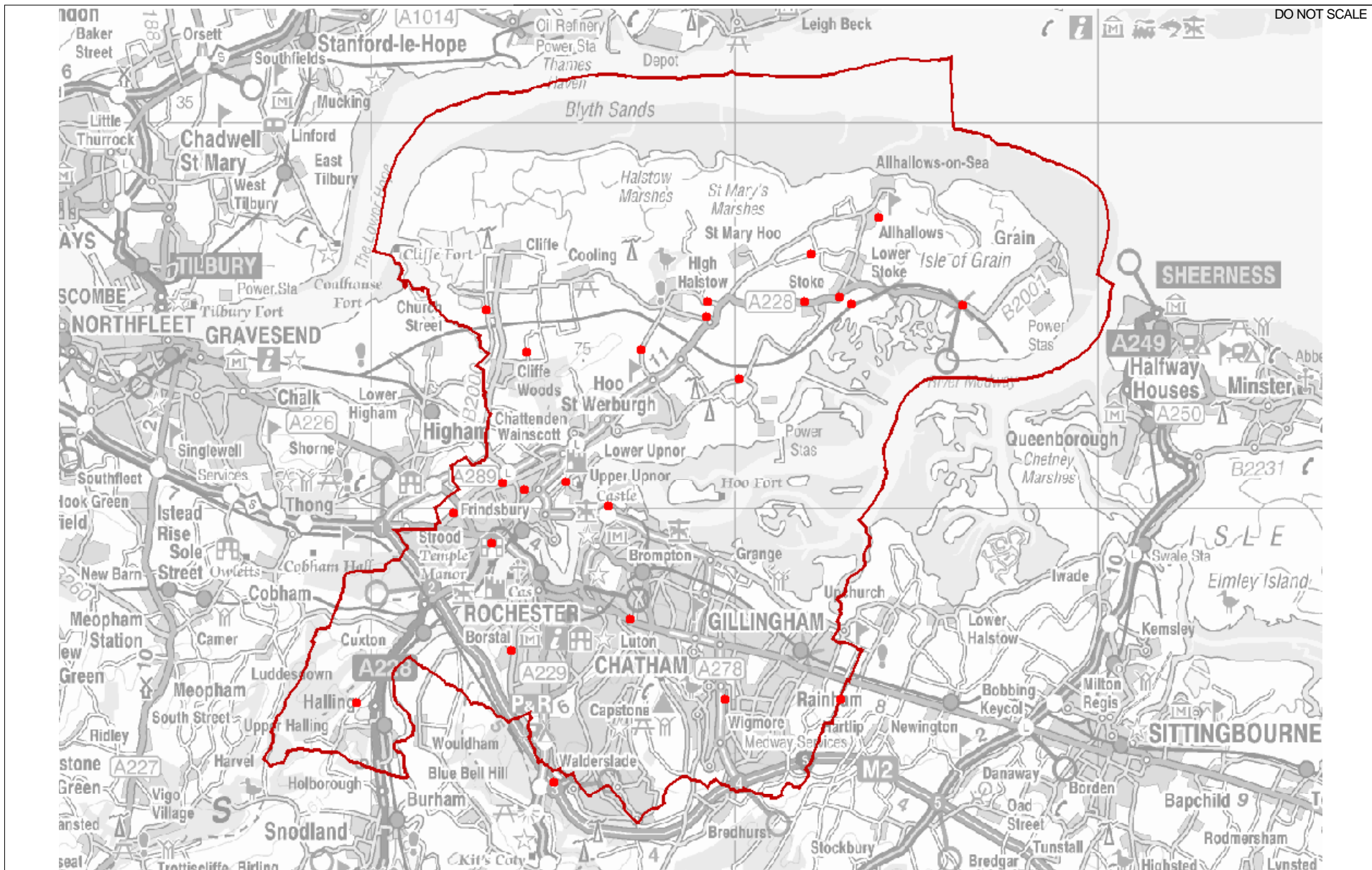
Twenty two incidents of flooding from local sources, or areas in which regular flood events from such sources occurred, have been plotted in Figure 4-2. The spread of events does not correlate with the Indicative Flood Risk Area shown in Figure 6-1 of this report.

Southern Water

Southern Water provided data relating to 376 incidents of flooding caused by rainwater inundation temporarily exceeding the capacity of the sewer network. A map of these events is shown in Figure 4-3.

It should be noted that 6 duplicated events, and 7 events whose postcodes were incorrect were removed from the mapping process, leaving a total of 363 events plotted.

Although the spread of events shown has a higher density in an area that lays within the Indicative flood Risk Area (Figure 6-1) the area covered by such events does not accurately reflect the the Indicative Flood Risk Area



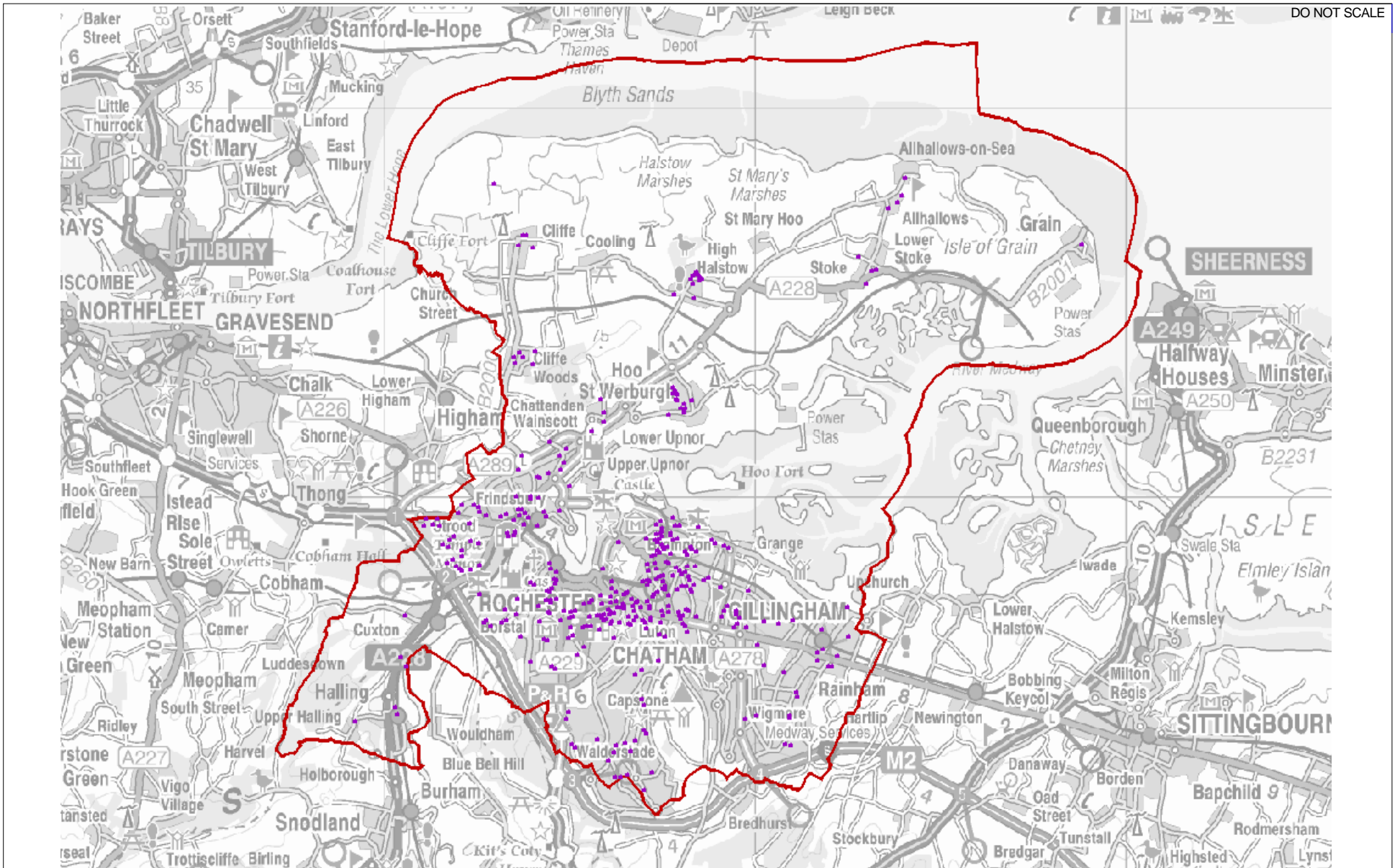
COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011."



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT ME4 4TRU
 Tel. (01634) 306000

- Key
- Medway Boundary
 - Historic Flood Events

Title
 Historic Flood Events
 Medway Highways Department
 Figure 4-2



COPYRIGHT RESERVED "This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011."



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT, ME4 4TRU
 Tel. (01634) 306000

- Key
- Medway Boundary
 - Historic Flood Events Southern Water

Title

**Historic Flood Events
 Southern Water
 Figure 4-3**

5 Future flood risk

5.1 Overview of future flood risk

Surface water flooding

No local information is currently available on surface water flood risk in Medway. The Environment Agency has produced a national assessment of surface water flood risk in the form of two national mapping datasets. The first generation national mapping, Areas Susceptible to Surface Water Flooding (AStSWF), contains three susceptibility bandings for a rainfall event with a 1 in 200 chance of occurring. The national methodology has since been updated to produce the Flood Map for Surface Water (FMfSW), a revised model containing two flood events (1 in 30 annual chance and 1 in 200 annual chance) and two depth bandings (greater than 0.1m and greater than 0.3m).

The two different datasets derive their outputs from differing assumptions regarding drainage rate, topography, density of buildings and several other factors. The FMfSW however, makes an assumption of 12mm per hour as a drainage rate in urban areas, whereas the AStSWF dataset assumes no drain rate at all. As Medway has an estimated drainage rate of between 20 and 30mm across its urban and rural areas it would be more appropriate to use the FMfSW to model future flood risk.

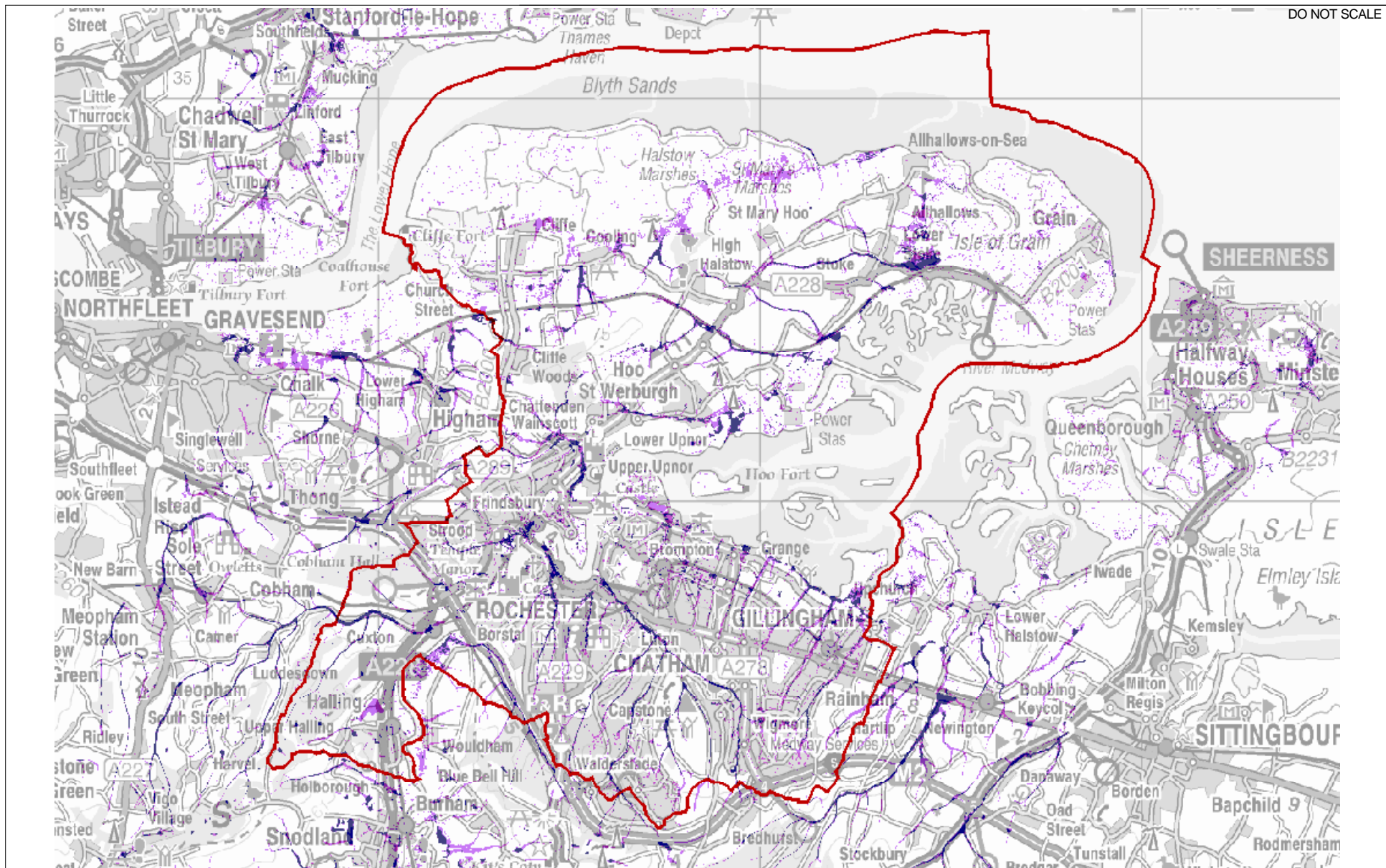
The locally agreed surface water information, therefore, which has been considered in conjunction with the Environment Agency in order to agree what surface water information best represents local conditions across Medway, is the Flood Map for Surface Water dataset. The Flood Map for Surface Water is illustrated in Figure 5-1 and Figure 5-2, highlighting areas at risk of surface water flooding in the future.

The mapping produced by the Environment Agency is very helpful in identifying potential problems but does not accurately reflect the records that we have. In most cases it appears to underestimate the drainage run off through the road and surface water drainage systems and is therefore considered only as a worst case.

The mapping from Environment Agency has been produced on a national scale and it is not surprising that it may not fully reflect the local position. The main risk of flooding in Medway comes from tidal flooding moving up river. This risk is not covered in the report as responsibility for assessing that risk rests with the Environment Agency. However, when reviewing the maps it is clear that it would be an oversimplification to merely remove the Environment Agency areas of responsibility from the report and pass on all risk. There is a risk of flooding from sources other than the main river which occurs because the outfalls are tide locked. Under the Act Medway remains responsible for investigating such incidents and risks.

For these reasons the general approach taken in this report is that the currently available information is helpful as a starting point but that the information is not sufficiently robust to use for accurate assessment of risk, nor for decisions as to response and future planning. The key element of the report is to set out how accurate and robust information will be gathered in the future and used to inform further development of flood risk plans.

The FMfSW layers in Figures 5-1 and 5-2 below shows an even spread of risk throughout Medway, with a slight increase in density in the Rochester, Chatham and Gillingham areas. This map does not, therefore show a notable correlation with the Indicative Flood Risk Area shown in Figure 6-1 of this report.



COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.



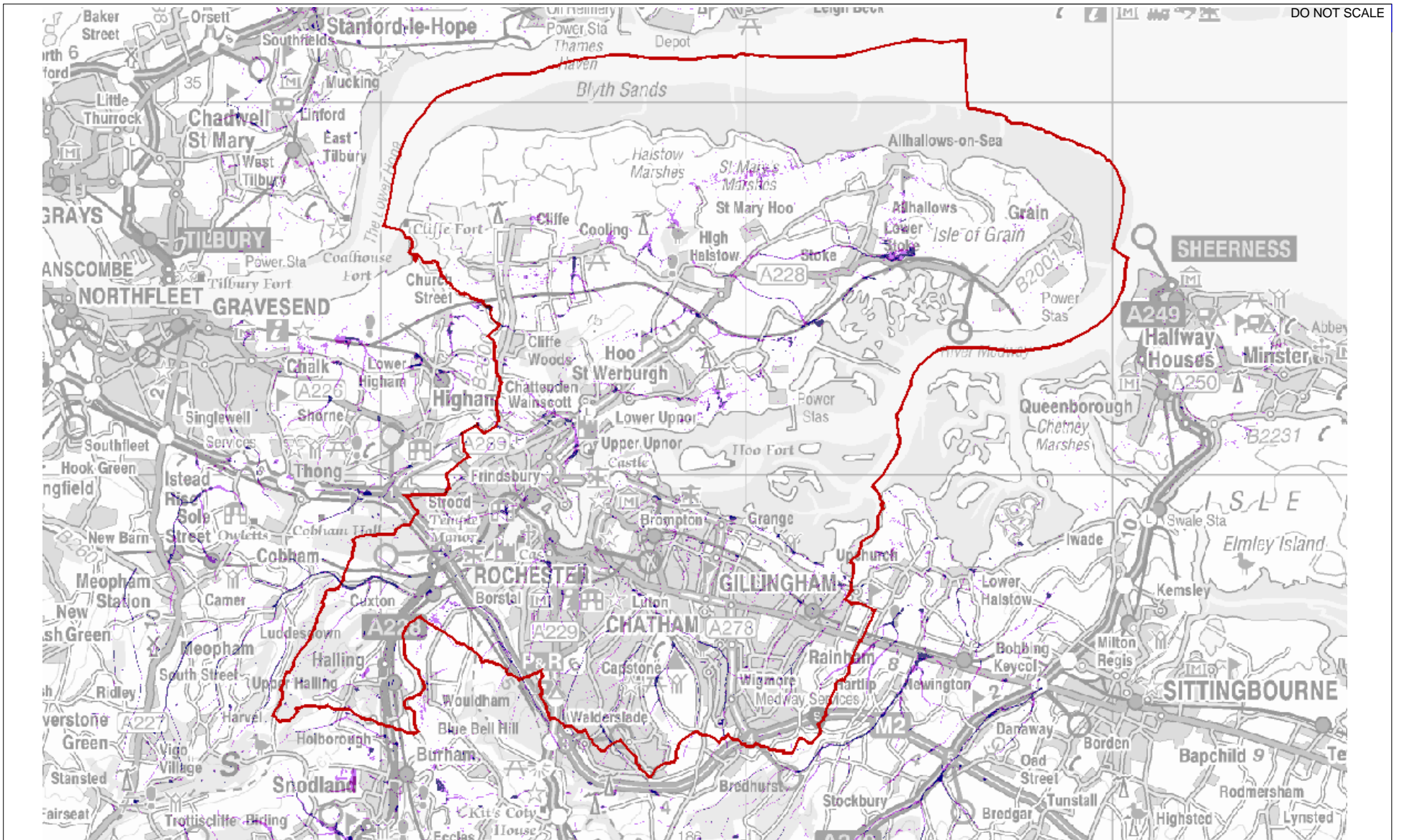
DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE

GUN WHARF
DOCK ROAD
CHATHAM
KENT, ME4 4TRU

Tel: (01634) 306000

Key	
	Medway Boundary
	Surface water shallow (more than 0.1m deep)
	Surface water deep (more than 0.3m deep)

Title
Flood Map for Surface Water
1 in 200 Annual Chance
Figure 5-1



DO NOT SCALE

COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE

GUN WHARF
DOCK ROAD
CHATHAM
KENT, ME4 4TRU
Tel: (01634) 306000

- Key
- Medway Boundary
 - Surface water shallow (more than 0.1m deep)
 - Surface water deep (more than 0.3m deep)

Title

FMSW 1 in 30

Figure 5-2

Groundwater flooding

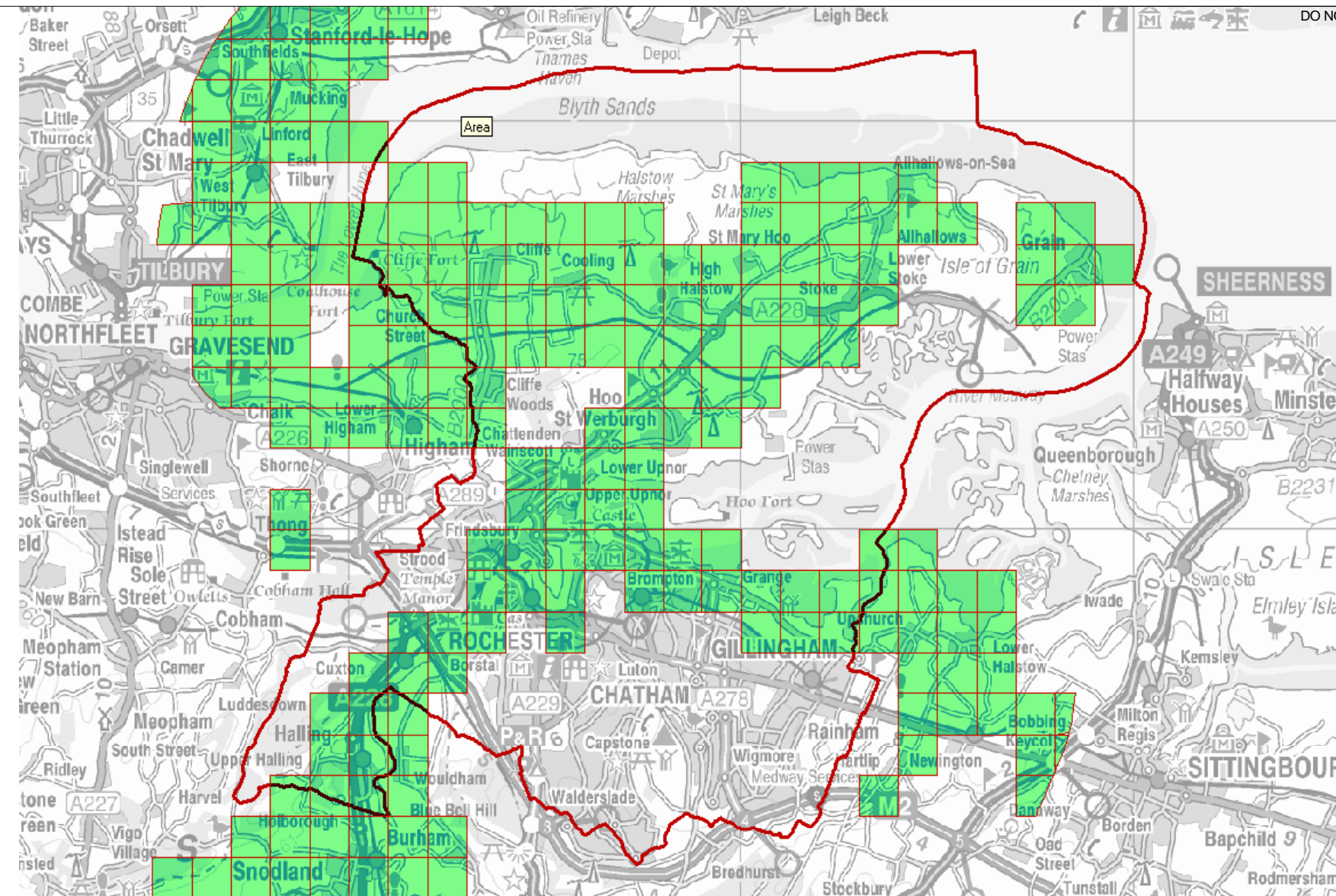
There is no local information available that provides evidence on future groundwater flood risk across Medway and groundwater rebound is not believed to be an issue in the area. The Environment Agency's national dataset, Areas Susceptible to Groundwater Flooding, has been used to form the basis of the assessment of future flood risk from groundwater. This dataset is illustrated in Figure 5-2 and areas at high risk from groundwater flooding are identified.

Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing groundwater flood areas on a 1km square grid. It was developed specifically by the Environment Agency for use by Lead Local Flood Authorities (LLFAs) for use in Preliminary Flood Risk Assessment (PFRA) as required under the Flood Risk Regulations. The data was produced to annotate indicative Flood Risk Areas for PFRA with information to allow LLFAs to determine whether there may be a risk of flooding from groundwater. It is also being made available to LLFAs to support PFRA, so that LLFAs can obtain a broad feel for the wider areas which might be at risk from groundwater flooding. It covers England and Wales.

This data has used the top two susceptibility bands of the British Geological Society (BGS) 1:50,000 Groundwater Flood Susceptibility Map and thus covers consolidated aquifers (chalk, sandstone etc., termed 'clearwater' in the data attributes) and superficial deposits (younger materials that are less than 10,000 years old, and sit above the bed rock, e.g. subsoil, clay, sand gravel and peat). It does not take account of the chance of flooding from groundwater rebound (seasonal recharge of the aquifer from wetter weather and decreased plant growth). It shows the proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. The susceptible areas are represented by one of four area categories (listed below) showing the proportion of each 1km square that is susceptible to groundwater emergence. It does not show the likelihood of groundwater flooding occurring.

In common with the majority of datasets showing areas which may experience groundwater emergence, this dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

The mapping below shows an even spread of risk throughout the Northern and central areas of Medway, with a marked absence of risk in the Southern areas, across some of Rochester, and most of Chatham and Gillingham. This map, therefore shows areas of risk and non-risk that directly contradicts the Indicative Flood Risk Area shown in Figure 6-1 of this report.



COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT ME4 4TRU
 Tel: (01634) 306000

- Key
- Medway Boundary
 - Areas Susceptible to Groundwater Flooding

Title
Areas Susceptible to Groundwater Flooding
 Figure 5-3

Canals

Medway has no canals within its administrative boundary.

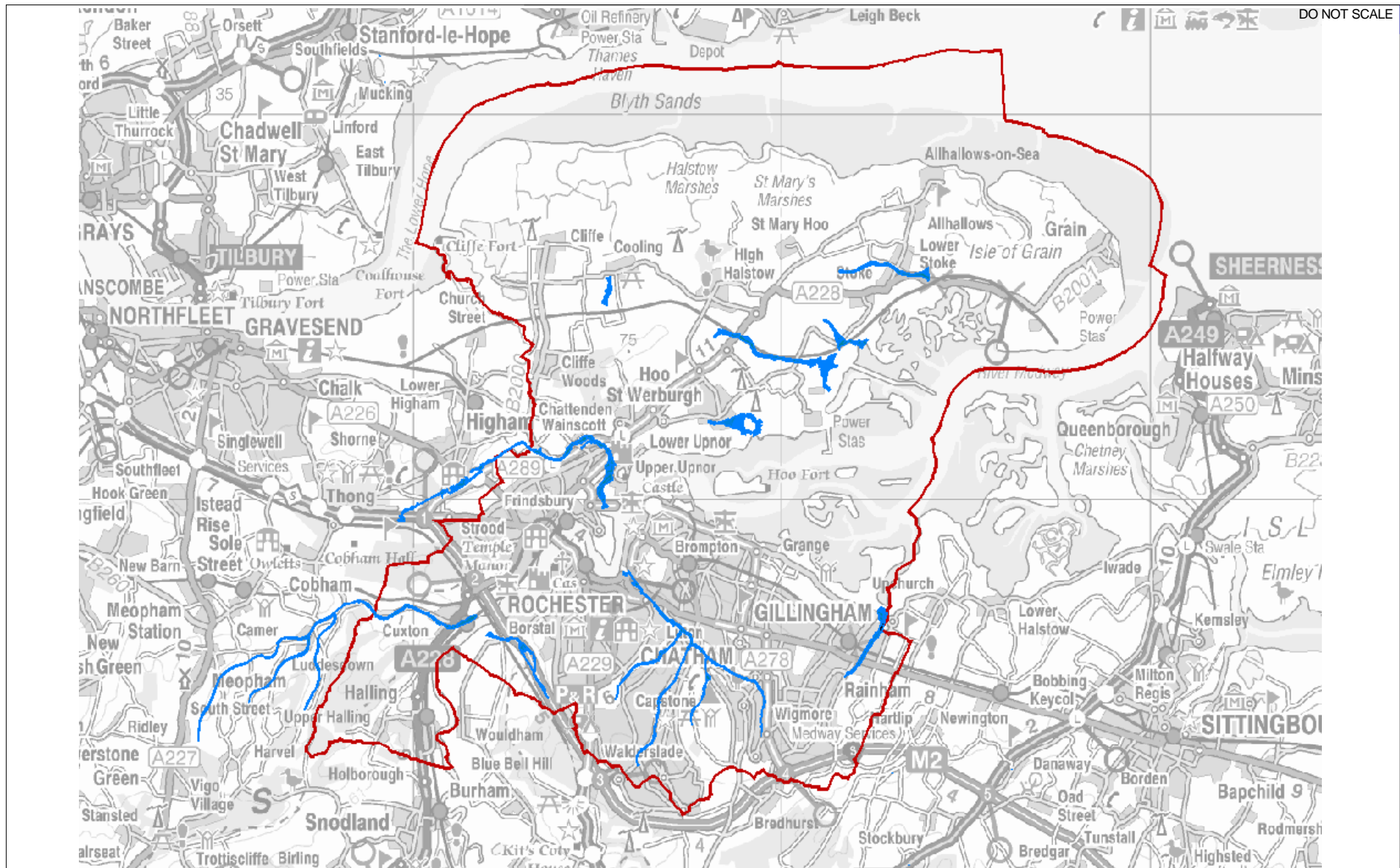
Ordinary watercourses

There is no reliable local information available that provides evidence on future ordinary watercourse flood risk across Medway. The Environment Agency's national Flood Map has been used to assess the risk of flooding from ordinary watercourses. The Flood Map shows the extent of flooding from the sea, all watercourses and rivers with a catchment of more than 3km². Smaller watercourses, will not, therefore be included in this method, yielding some inaccuracy.

The Flood Map has two main layers, Tidal and Fluvial. Tidal flooding, which is from the Sea is the responsibility of the Environment Agency and has, therefore not been used in this process. The map is split into Flood Zone 2 (1 in 1000 year risk) and Flood Zone 3 (1 in 100 year fluvial risk and 1 in 200 year tidal risk). As these zones are virtually identical within the Medway boundary, only Flood Zone 2 has been shown below in Figure 5-4. These maps have had areas of flooding from the Sea and Main River (the responsibility of the EA) cut out, leaving only areas of potential flooding from ordinary watercourses.

Ordinary watercourses that are the responsibility of Medway Council as LLFA are shown in Figure 5-5, a modification of the Detailed River Network (DRN) map (Figure 1-5). These have been deduced by removing areas that are covered by the Environment Agency and LMIDB from the DRN. A comparison of these areas with the modified Flood Map's modified Fluvial Flood Zones 2 and 3 shows that several watercourses theoretically represent a flood risk. These are shown in Figure 5-6. In this map the modified Flood Map of Flood Zones 2 and 3 have been overlayed onto the modified DRN, with areas at risk ringed in red.

The spread of risk shown in Figure 5-6 does not correlate with the Indicative Flood Risk Area shown in Figure 6-1 of this report



DO NOT SCALE

COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.

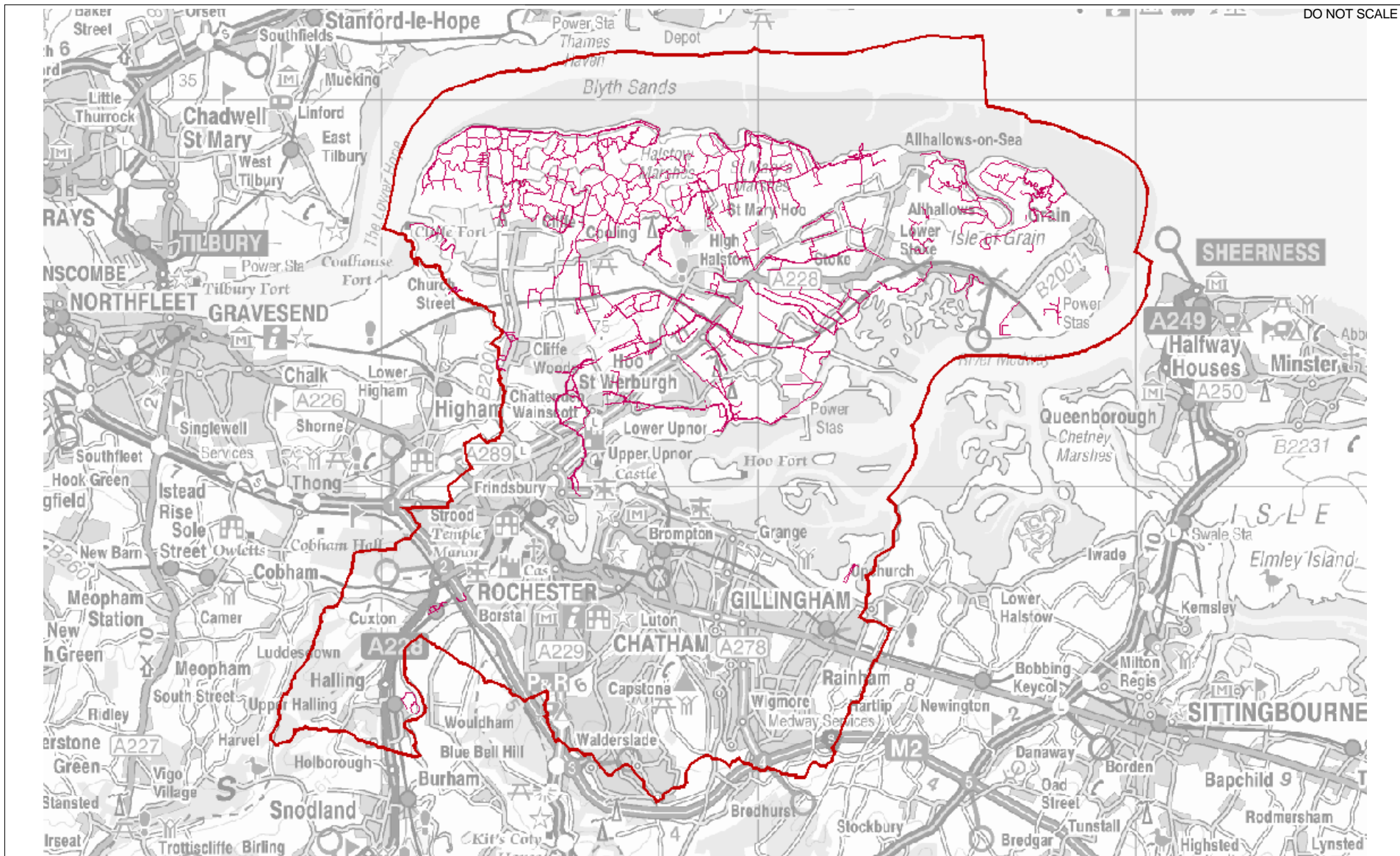


DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT, ME4 4TRU
 Tel. (01634) 306000

Key

- Medway Boundary
- Flood risk areas

Title
Modified Fluvial Flood Zone 2
Flooding from Main River and Sea removed
 Figure 5-4



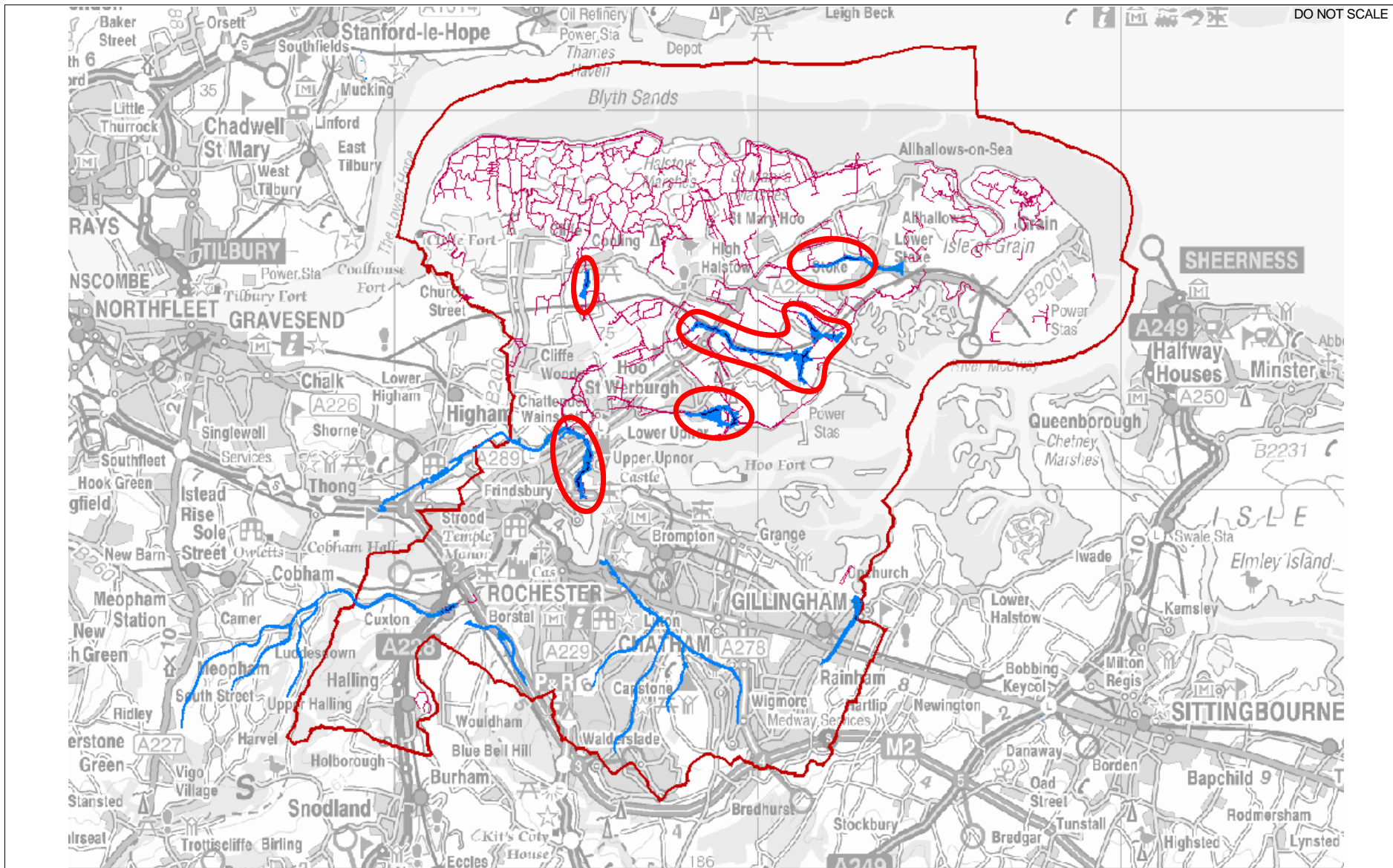
COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office. Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011."



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
GUN WHARF
DOCK ROAD
CHATHAM
KENT. ME4 4TRU
Tel. (01634) 306000

- Key
- Medway Boundary
 - Modified Detailed River Network

Title
Modified Detailed River Network
Figure 5-5



DO NOT SCALE

COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.







DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE

GUN WHARF
DOCK ROAD
CHATHAM
KENT, ME4 4TRU

Tel. (01634) 306000

Key

-  Medway Boundary
-  Modified Detailed River Network
-  Modified Fluvial Flood Zone 2, Flooding from Main River and Sea removed
-  Theoretical flood risk areas

Title

Modified Fluvial Flood Zone 2,
Flooding from Main River and Sea removed
and Modified Detailed River Network
Figure 5-6

5.2 Potential consequences of future flooding

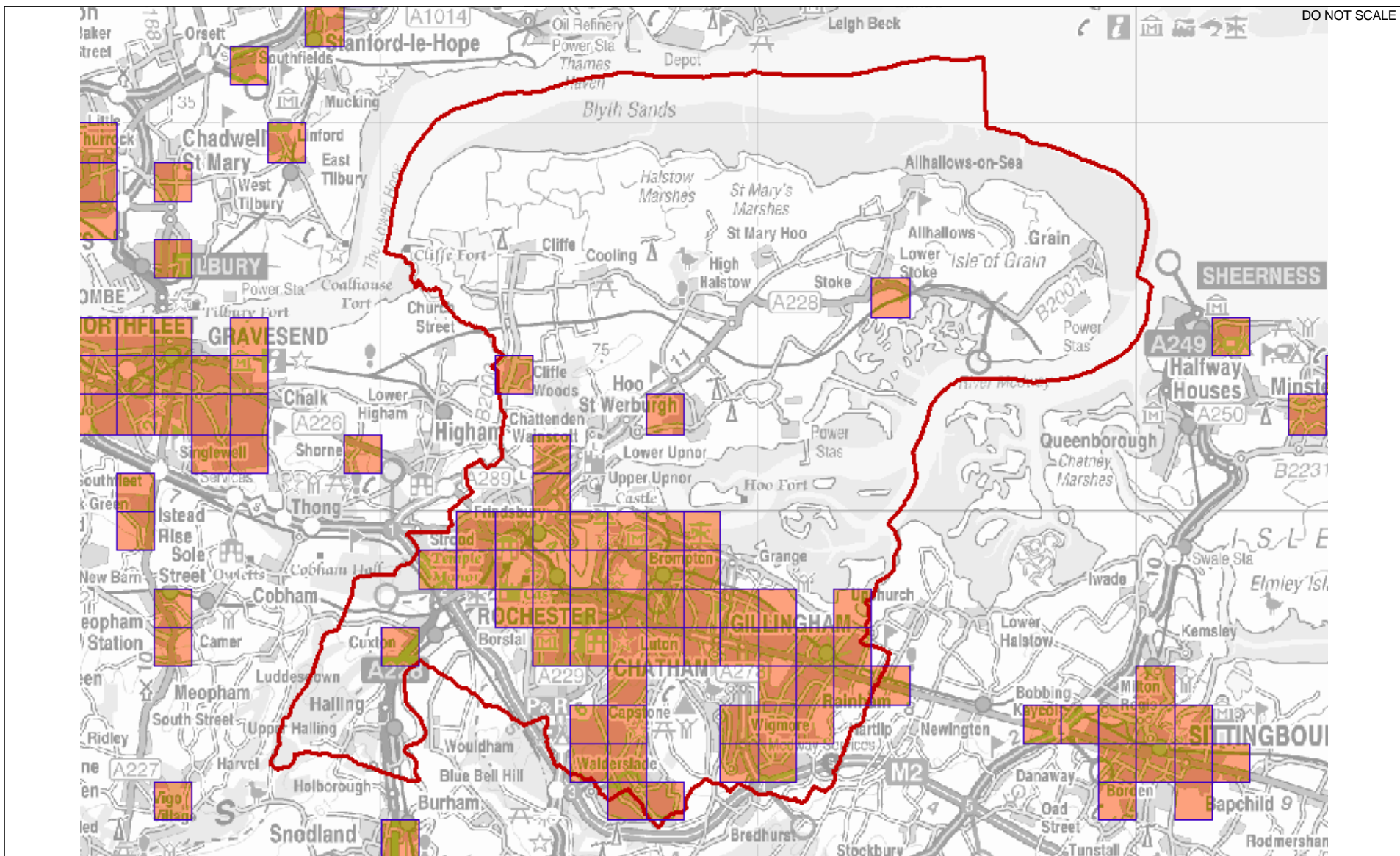
The Environment Agency has used the Flood Map for Surface Water mapping and the National Receptors Database to identify a number of areas across the country that exceed a given threshold, described in Figure 5-7 below. For the purpose of initially identifying areas at risk the EA used a definition of significant harmful consequence as follows.

Figure 5-7: Table showing Flood Risk Threshold used to identify future consequences of flooding

Significant harmful consequences defined as greater than...	Description
200 people <i>or</i>	<i>Flooded to a depth of 0.3m during a rainfall event with a 1 in 200 chance of occurring (or 0.5%).</i>
20 businesses <i>or</i>	
1 critical service	

This assessment was carried out based on 1km squared national grid squares, and the grid squares that exceed this criterion were identified. The grid squares within Medway where flood risk is considered to exceed this threshold are illustrated in Figure 5-8. These areas represent where flood risk is considered to be the most severe across the area. The potential consequences on key flood risk indicators (as discussed in Table 3-1) have been assessed by the Environment Agency.

The outputs of this model were used to inform the Indicative Flood Risk Areas map (shown in Figure 6-1) that originally identified Medway as an area requiring further investigation through the PFRA process.



COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE
 GUN WHARF
 DOCK ROAD
 CHATHAM
 KENT, ME4 4TRU
 Tel: (01634) 306000

- Key
- Medway Boundary
 - Areas Above the Flood Risk Threshold

Title
Areas Above the Flood Risk Threshold
 Figure 5-8

5.3 Effect of climate change and long term developments

Section 5.3 is a mandatory excerpt from the Environment Agency's PFRA report template.

The evidence

There is clear scientific evidence that global climate change is happening now. It cannot be ignored. Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation, however the broad trends are in line with projections from climate models. Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in future. Past GHG emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

We have enough confidence in large-scale climate models to say that we must plan for change. There is more uncertainty at a local scale but model results can still help us plan to adapt. For example we understand rain storms may become more intense, even if we can't be sure about exactly where or when. By the 2080s, the latest UK climate projections (UKCP09) are that there could be around three times as many days in winter with heavy rainfall (defined as more than 25mm in a day). It is plausible that the amount of rain in extreme storms (with a 1 in 5 annual chance, or rarer) could increase locally by 40%.

Key projections for Thames River Basin District

If emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past are:

- winter precipitation increases of around 15% (very likely to be between 2 and 32%);
- precipitation on the wettest day in winter up by around 15% (very unlikely to be more than 31%);
- relative sea level at Sheerness very likely to be up between 10 and 40cm from 1990 levels (not including extra potential rises from polar ice sheet loss);
- peak river flows in a typical catchment likely to increase between 8 and 18%.

Implications for flood risk

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability. Wetter winters and more of this rain falling in wet spells may increase river flooding in both rural and heavily urbanised catchments. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

Rising sea or river levels may increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses. There is a risk of flooding from groundwater-bearing chalk and limestone aquifers across the district. Recharge may increase in wetter winters, or decrease in drier summers.

Adapting to change

Past emissions mean some climate change is inevitable. It is essential we respond by planning ahead. We can prepare by understanding our current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits. Although the broad climate change picture is clear, we have to make local decisions under uncertainty. We will therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help to ensure that we do not increase our vulnerability to flooding.

Long-term developments

It is possible that long-term developments might affect the occurrence and significance of flooding. However current planning policy aims to prevent new development from increasing flood risk.

In England, Planning Policy Statement 25 (PPS25) on development and flood risk aims to "ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall."

In Wales, Technical Advice Note 15 (TAN15) on development and flood risk sets out a precautionary framework to guide planning decisions. The overarching aim of the precautionary framework is "to direct new development away from those areas which are at high risk of flooding."

Adherence to government policy ensures that new development does not increase local flood risk. However, in exceptional circumstances the Local Planning Authority may accept that flood risk can be increased contrary to government policy, usually because of the wider benefits of a new or proposed major development. Any exceptions would not be expected to increase risk to levels which are "significant" (in terms of the government's criteria).

6 Flood risk areas

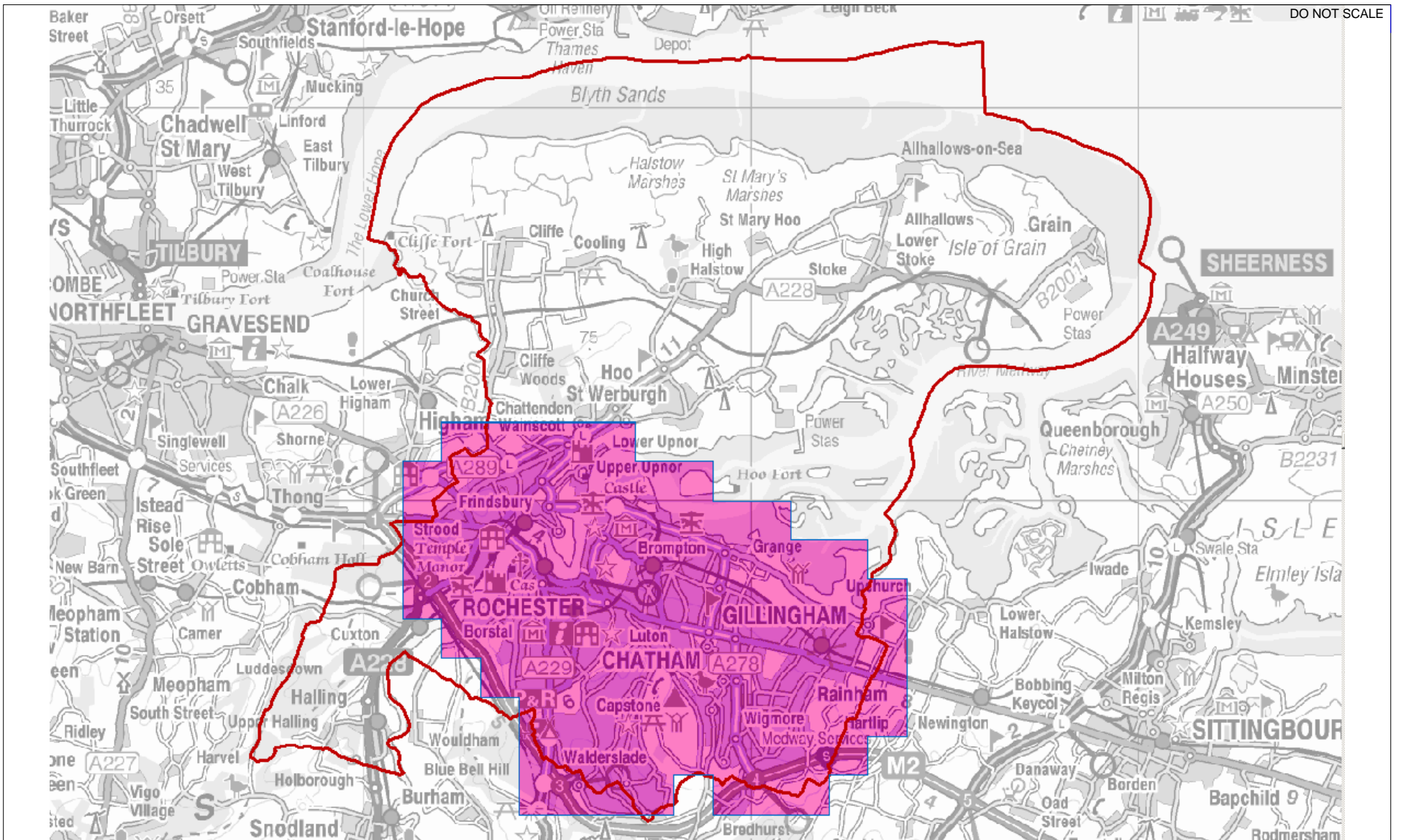
6.1 Overview

In order to ensure a consistent national approach, Defra have identified significance criteria and thresholds to be used for defining flood risk areas. Guidance on applying these thresholds has been released in Defra's document "Selecting and reviewing Flood Risk Areas for local sources of flooding". In this guidance document, Defra have set out agreed key risk indicators and threshold values that must be used to determine Flood Risk Areas. The methodology is based on using national flood risk information to identify 1km squares where local flood risk exceeds a defined threshold; these areas within Medway are illustrated in Figure 5-3. Where a cluster of these grid squares leads to an area where flood risk is most 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. This guidance has now been released and the Environment Agency has applied it to identify Indicative Flood Risk Areas across the country. Of the ten (10) national Indicative Flood Risk Areas, one falls within Medway Council's administrative boundary, as shown in Figure 6-1 below.

It is felt that the Indicative Flood Risk Area falls within the Medway boundary by virtue of its population density, and as a result of the Environment Agency's assumption of local drainage rate in modelling surface water, rather than through a robust case that demonstrates actual risk. Although the actual drainage rate is not known, it is estimated to be significantly higher than that used in the model used to identify the Indicative Flood Risk Area.

This report has identified that some risk may exist, though none that would cause "significant harmful consequence", and that the quality of data gathered is insufficient to support or contest the Indicative Flood Risk Area. Medway Council, therefore accepts the Indicative Flood Risk Area shown in Figure 6-1.

Future mapping of Flood Risk will, therefore include surveys and modelling to quantify any risk. The formation of a Medway Flood Group will ensure a uniformity of data quality and a definition of, and adherence to best practice that will enable more accurate indications of actual flood risk areas.



DO NOT SCALE

COPYRIGHT RESERVED This map is reproduced from Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. Medway Council Licence Number 100024225, 2011.



DIRECTORATE OF REGENERATION, COMMUNITY AND CULTURE

GUN WHARF
DOCK ROAD
CHATHAM
KENT, ME4 4TRU

Tel. (01634) 306000

- Key
- Medway Boundary
 - Indicative Flood Risk Area

Title

Indicative Flood Risk Areas
Figure: 6-1

7 Next steps

7.1 Future data management arrangements

In order to continue to fulfil their role as Local Lead Flood Authority, Medway Council is required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information. It is crucial that all records of flood events are documented consistently and in accordance with the INSPIRE Directive (2007/2/EC). It is recommended that a centralised database will be kept up to date by Medway Council, who have the overall responsibility to manage flood data through the whole administrative area. This can be used as an evidence base to inform future assessments and reviews and for input into the mapping and planning stages.

Future Flood Group meetings will discuss efficient methods of ongoing data gathering and communication as a priority, as well as assessing and mapping and planning for future flood risk,

Medway Council is already working with the SE7 group of authorities to develop a standardised approach to data collection relating to future flood events, including the collection of data using a publically accessible web portal.

7.2 Scrutiny and review procedures

The scrutiny and review procedures that must be adopted when producing a PFRA are set out by the European Commission. Meeting quality standards is important in order to ensure that the appropriate sources of information have been used to understand flood risk and the most significant flood risk areas are identified. Another important aspect of the review procedure is to ensure that the guidance is applied consistently; a consistent approach will allow all partners to understand the risk and manage it appropriately. The scrutiny and review procedure will comprise two key steps, as discussed below.

Local authority review

The first part of the review procedure is through an internal local authority review of the PFRA, in accordance with appropriate internal review procedures. Internal approval should be obtained to ensure the PFRA meets the required quality standards, before it is submitted to the Environment Agency. Within Medway, the PFRA will be presented to the Regeneration and Community and Culture Overview and Scrutiny Committee for approval before submission to the Environment Agency in draft form. Following their review and comments a final version will be submitted to Medway Council's Cabinet.

Environment Agency review

Under the Flood Risk Regulations, the Environment Agency has been given a role in reviewing, collating and publishing all of the PFRAs once submitted. The Environment Agency will undertake a technical review (area review and national review) of the PFRA, which will focus on instances where Flood Risk Areas have been amended and ensure the format of these areas meets the provide standard. If satisfied, they will recommend submission to the relevant Regional Flood Defence Committee (RFDC) for endorsement. RFDCs will make effective use of their local expertise and ensure consistency at a regional scale. Once the RFDC has endorsed the PFRA, the relevant Environment Agency Regional Director will sign it off, before all PFRAs are collated,

published and submitted to the European Commission. The first review cycle of the PFRA will be led by Medway Council and must be submitted to the Environment Agency by 22 June 2017. They will then submit it to the European Commission by 22 December 2017 using the same review procedure described above.

The EA has nationally relaxed the 22 June deadline to allow for pressures relating to the local election process. A submission of a working draft will be made to the the EA on or before the 22nd June.

8 References

Essex County Council Preliminary Flood Risk Assessment Jan 2011.

Brown, S. Beswick, M. et al. (2008) Met Office Submission to the Pitt Review - Executive Summary, The extreme rainfall of Summer 2007 and future extreme rainfall in a changing climate.

Defra (2006) Flood and Coastal Defence Appraisal Guidance, FCDPAG3 Economic Appraisal, Supplementary Note to Operating Authorities – Climate Change Impacts. October 2006. Available from <http://www.defra.gov.uk/environment/flooding/documents/policy/guidance/fcdpag/fcd3cl#>

Defra (2010) Selecting and reviewing Flood Risk Areas for local sources of flooding – Guidance to Lead Local Flood Authorities. Available from <http://www.defra.gov.uk/environment/flooding/documents/research/flood-risk-method.pdf>

Defra (2010) Surface Water Management Plan Technical Guidance.

Environment Agency (2009) Thames Catchment Flood Management Plan.

Environment Agency (2010) Preliminary Flood Risk Assessment - Final Guidance (Report –GEHO1210BTGH-E-E). Available from <http://publications.environment-agency.gov.uk/pdf/GEHO1210BTGHe-e.pdf>

Environment Agency (2010) Preliminary Flood Risk Assessment – Annexes to the Final Guidance (Report GEHO1210BTHF-E-E). Available from <http://publications.environment-agency.gov.uk/pdf/GEHO1210BTHFe-e.pdf>

Environment Agency Building Trust with Communities.

Miller, H.L. (eds.). Summary for Policymakers. Climate Change 2007: The Physical Science Basis.

Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate.

Change Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. 9. Available for download from <http://www.ipcc.ch/ipccreports/ar4-wg1.htm>

Annexes

Annex 1: Records of past floods and their significant consequences (Preliminary Assessment Spreadsheet)

Please refer to Annex 1 of the Preliminary Assessment Spreadsheet attached with this report. Due to the lack of data available regarding the consequences of past flooding, as discussed in Chapter 4.3, no flood events have been considered to have significant harmful consequences, so none have been recorded in this section.

Annex 2: Records of future floods and their significant consequences (Preliminary Assessment Spreadsheet)

Please refer to Annex 2 of the Preliminary Assessment Spreadsheet attached with this report. This spreadsheet includes a complete record of future flood risk within Medway, including details of the potential consequences of flooding to key risk receptors within the county.

Annex 3: Records of Flood Risk Area and its rationale (Preliminary Assessment Spreadsheet)

Please refer to Annex 3 of the Preliminary Assessment Spreadsheet attached with this report. No flood risk area has been identified.

Annex 4: Review Checklist

Please refer to Annex 4, attached to this report, which contains the Review Checklist that has been provided by the Environment Agency to act as a checklist for reviewing PFRA submissions.

Annex 5 - Historic Flood Event Data

Please refer to Annex 6, attached to this report, which contains a spreadsheet detailing all Historic Flood Event Data submitted by Medway Council Highways Department, Lower Medway Internal Drainage Board, Southern Water and Kent Fire and Rescue Service. Although the 11 parishes were asked for data none was given, and therefore none from this source can be included in this section.