

# *Flood Risk Mapping and Forecasting in England*

Mark Franklin

Environment Agency, England

NORDESS Workshop on Risk Assessment and Acceptable Risk

# Euro 2016: Iceland beat England and 'shock the world'

🕒 28 June 2016 | Football



Euro 2016: Kolbeinn Sigthorsson gives Iceland a 2-1 lead against England

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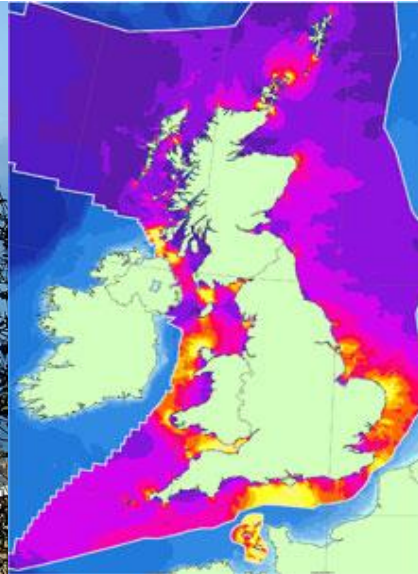
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**How did England rate in**



# Outline

- ➔ Flood risk in England
- ➔ Who we are and how we work
- ➔ Understanding risk
- ➔ Managing risk
- ➔ Responding to incidents



# Flooding in England

~2.5m properties at risk of flooding from rivers and the sea

~1m of these are in Coastal Areas

~3m at risk of flooding from surface water



# Who we are and how we work: *governance*



Department for Environment  
Food and Rural Affairs

**Flood & coastal erosion risk management  
(FCRM) policy & research**

**Local councils (coastal erosion management),  
spatial planning**

**Regulator: water, waste, carbon, biodiversity**

**Operator: FCRM strategy, mapping &  
modelling, warning & informing, incident  
management, partnership working, direct  
investment (river & sea flooding) & budget  
management**

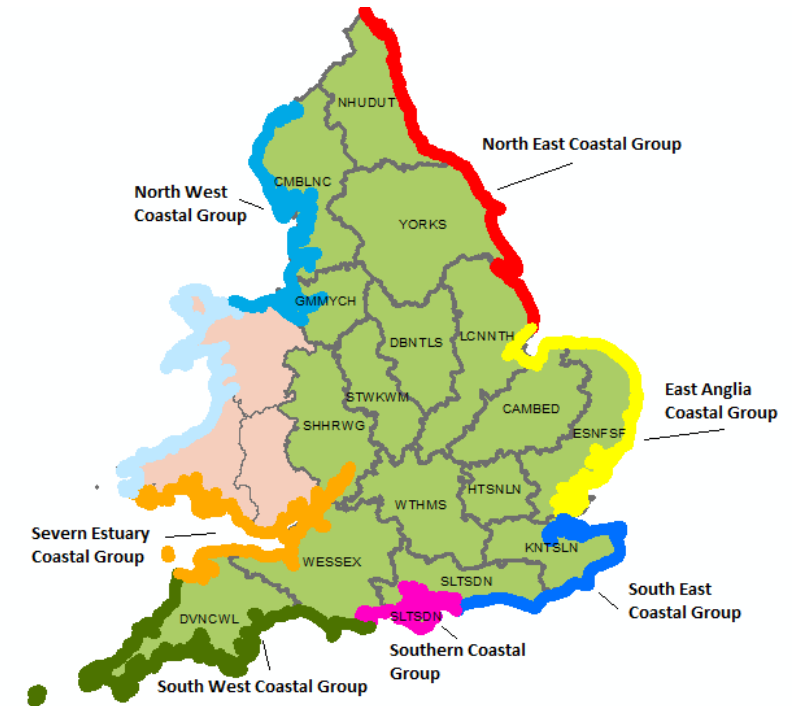
**Adviser: policy development and delivery**

**Marine spatial planning, marine licensing  
& management**

**Biodiversity adviser and regulator,  
including designated sites**



Department for Communities  
and Local Government

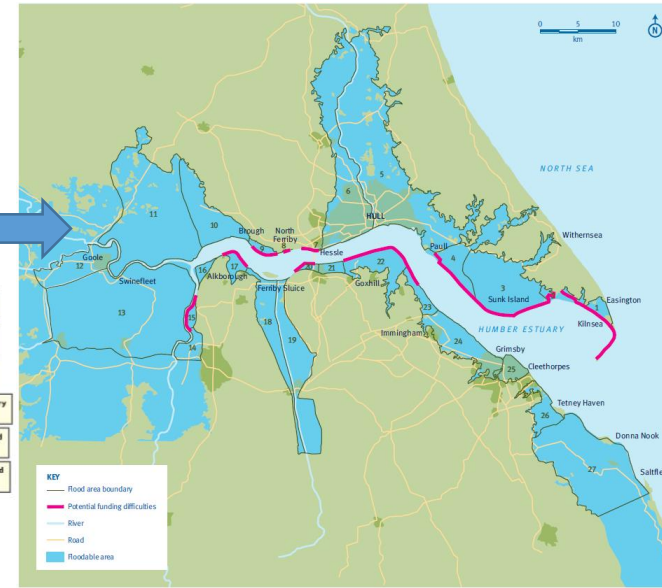
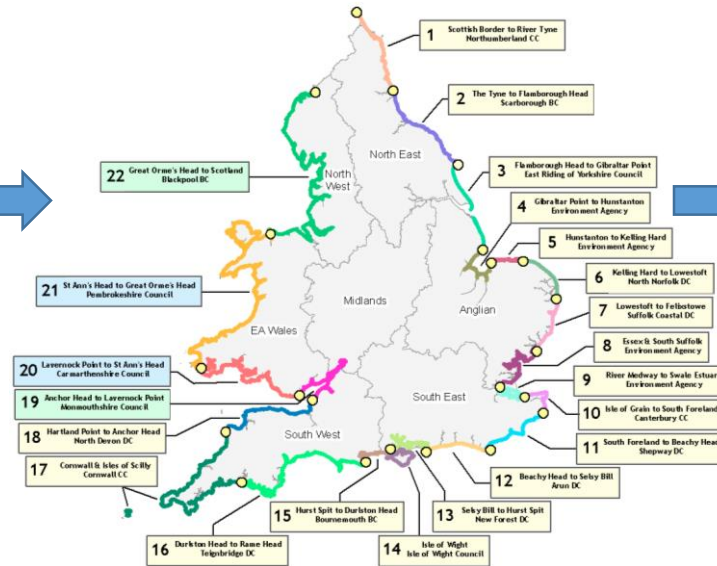


# Who we are and how we work: *strategic FCRM planning at the coast*



Understanding the risks,  
empowering communities,  
building resilience

The national flood and coastal erosion  
risk management strategy for England



## Flood areas

We believe that in future we could have difficulty getting funds to improve the defences protecting some of these areas. The areas where we think this might happen are shown in pink on the map and in the list below.

If you think you could be affected and would like some more information please contact us using the details at the end of the document.

- 1 Easington and Kilsno
- 2 Skeffling
- 3 Sunk Island (Winstead Drain to Stone Creek)
- 4 Stone Lock to Paul Holme Sluice
- 5 Hull East (including Paul Village)
- 6 Hull West (Hull Barrier to Hessel Haven)
- 7 Hessel (Hessel Haven to Hessel Country Park Hotel)
- 8 North Ferry
- 9a Brough (Wilton Water)
- 9b Brough (BAC Works)
- 10 Brough Haven to Weighon Lock
- 11 Weighon Lock to Boothferry Bridge
- 12 Goole
- 13 Goole Fields and Crowle
- 14 Gunness to Flaborough
- 15 Flaborough Grange
- 16 Alborough
- 17 Whitton to Wintlington
- 18 Wintlington Ings
- 19 South Ferry
- 20a Barton Cliff to Humber Bridge
- 20b Humber Bridge to Barton Haven
- 21 Barton Haven to Barmston Haven
- 22 Barmston Haven to East Hulton Skitter
- 23a Hulton Marshes
- 23b Killingholme Marshes
- 24 Immingham to West Grimsby
- 25 East Grimsby
- 26 Cleethorpes and Humberston
- 27 Tetney to Saltfleet Haven



National FCRM Strategy

*Update scheduled*

Shoreline Management Plans

*Mid-term reviews, risk analysis*

Coastal / Estuary Strategies

*Thames Estuary, Humber, Exe, Cumbria*

Projects

*Clacton, Dawlish*

# Understanding risk: *mapping, modelling & data*

- ➔ Updating our National Flood Risk Assessment
- ➔ Coastal Flood Boundary data set improvements
- ➔ Updates to National Coastal Erosion Maps
- ➔ Coastal Hazard Mapping
- ➔ Modelling standards in large estuaries and open coasts
- ➔ iCoasst
- ➔ Wave ensemble modelling
- ➔ Other research priorities







# Understanding risk: *key initiatives (1)*

## ➔ National Flood Risk Assessment

Data improvements from Met Office Wave Watch III 34 year hindcast, sea defence asset data from Asset Information Management System and new Surf Zone Digital Terrain Model

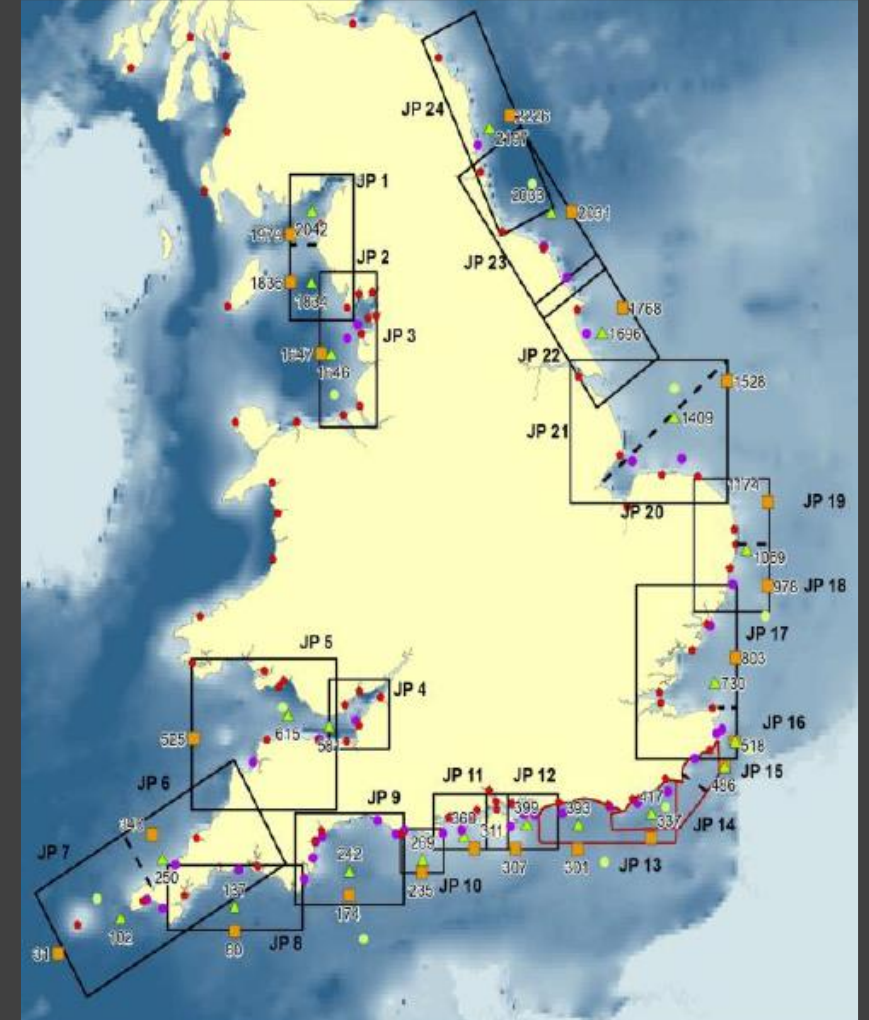
Modelling improvements to joint probability, wave transformation and overtopping models

## ➔ Coastal Flood Boundary data

Updates to spatially consistent set of sea levels, uncertainty data and design surge profiles using new data from coastal monitoring.

## ➔ Coastal Erosion data

Updates to nationally consistent coastal erosion projections using local authority information and tested methodology, with public facing maps.



# Understanding risk: *key initiatives (2)*

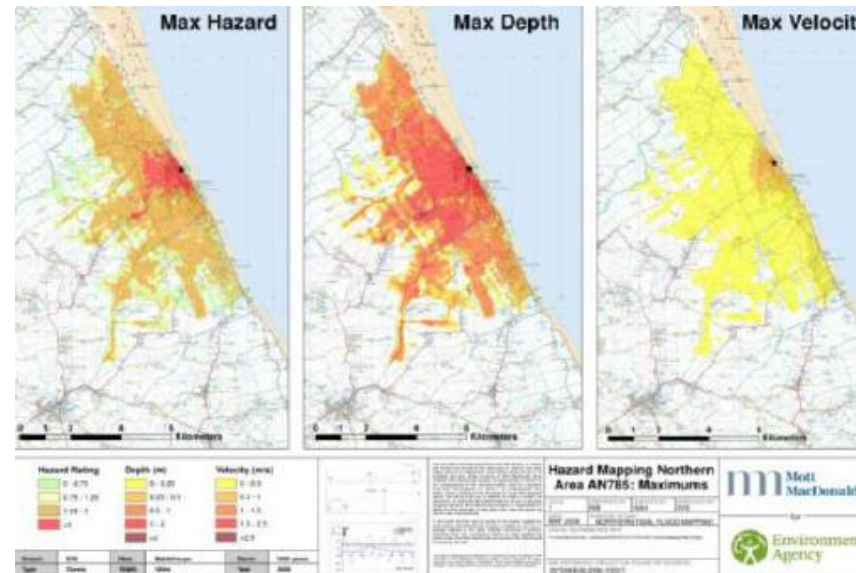
➔ Major Incident Ready Programme

➔ H19 East Coast review

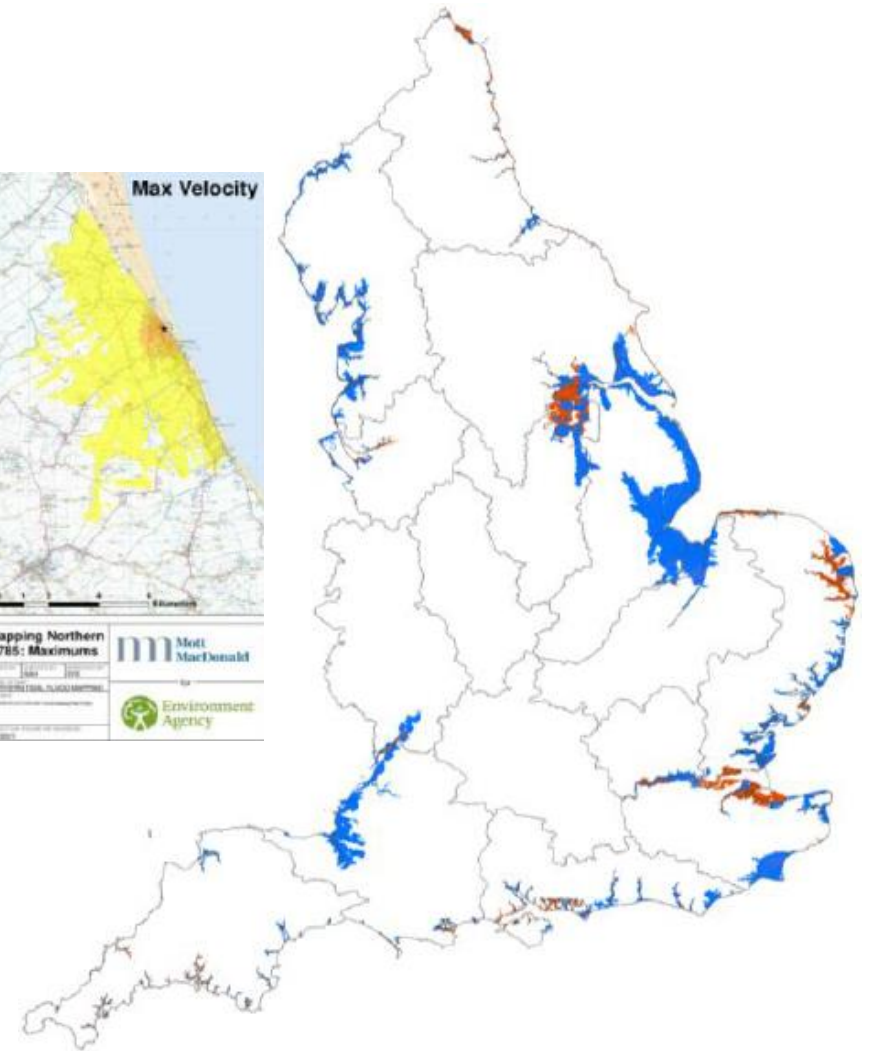
➔ Coastal modelling standards

➔ Coastal Hazard Maps

- ➔ Inter-operability: guidelines and training
- ➔ Gap analysis
- ➔ Consistency in modelling and visualisation

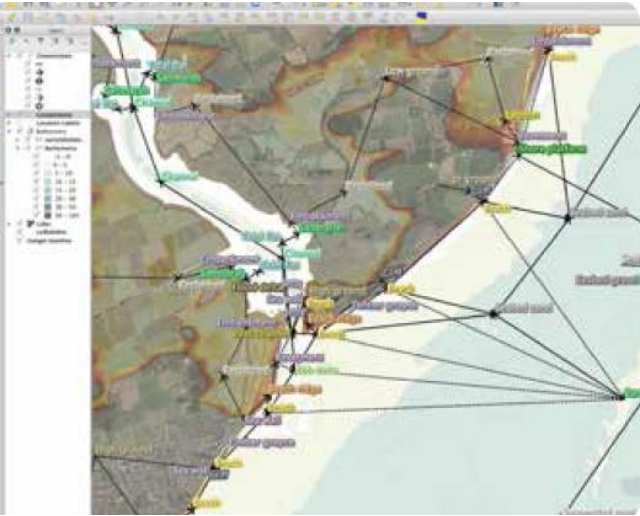


Helen Colyer: Project Manager



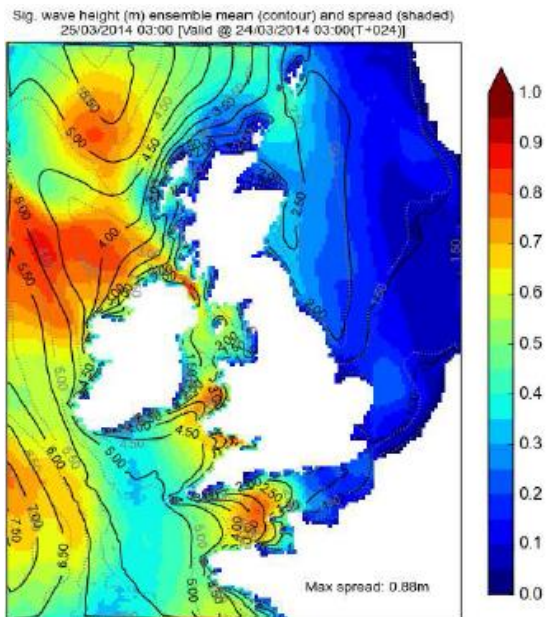


# Understanding risk: *key initiatives (3)*



- ➔ Integrated Coastal Sediment Systems (iCoasst)
  - ➔ Coastal & Estuarine Systems Maps
  - ➔ Coastal State Indicators evaluation
  - ➔ Model improvements: ASMITA, UnaLinea and SCAPE+
  - ➔ New models: ESTEEM and Meso-I
  - ➔ Model linkage demonstrations

- ➔ Wave ensemble modelling improvements
  - ➔ probabilistic tide/surge water level plus sea state
  - ➔ operational Ensemble Prediction System (EU FP7 'Mywave')
  - ➔ future combination with real time in situ observation data



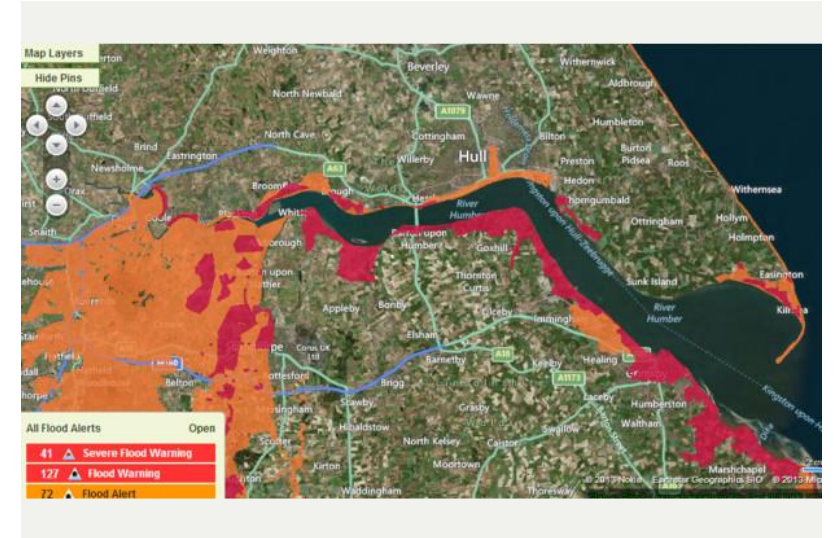
# Understanding risk: *other research activities*

- ➔ Better understanding and management of mixed beaches
- ➔ Improvements to the 'Eurotop' manual
- ➔ Innovation in beach recharge techniques
- ➔ Synthesising analytical approaches to sediment budgets
- ➔ Effective management of defence toe structures

# Managing risk: *planning* (1)

## ➔ Humber strategy update

- ➔ 400,000 people below the 5m contour, £billions at risk
- ➔ 2007 approved strategy including £323million 25 year expenditure and strategic approach to habitat creation
- ➔ New legislation (2010), 'Partnership Funding' (2012) and tidal surge (2013: 40km defences overtopped, 7,000ha flooded)
- ➔ Revised strategy incorporates mathematical modelling for decision support, new site investigation techniques and green infrastructure

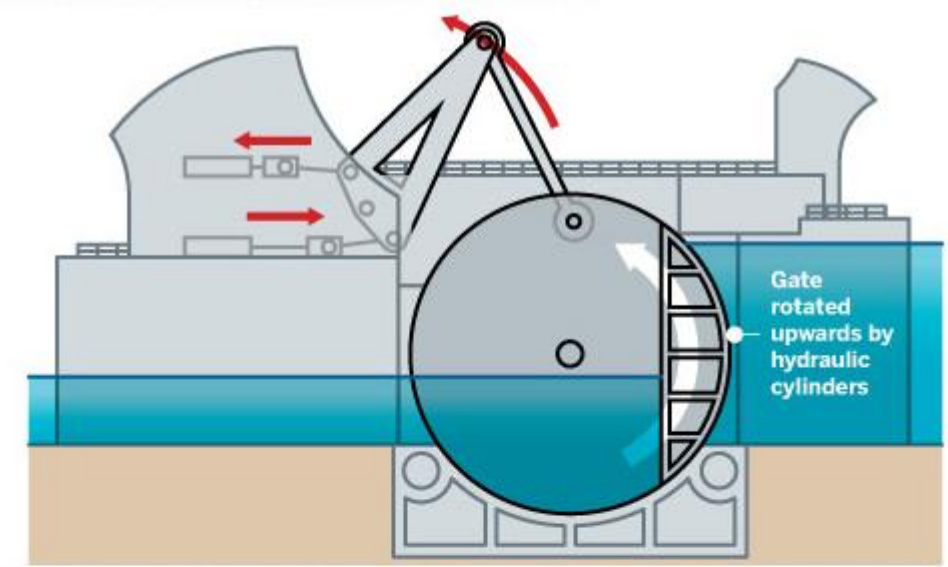




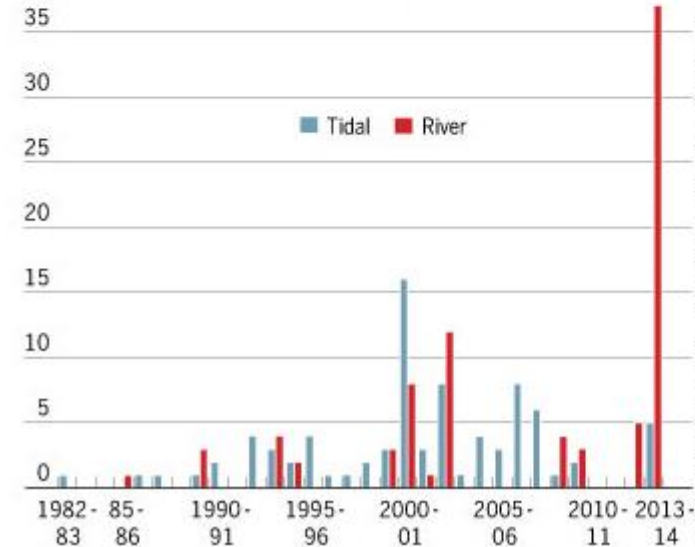
# Managing risk: *planning* (2)

## ➡ Thames Estuary Asset Management 2100

- ➡ 2012 'TE2100' plan involves £3.2billion investment in first forty years 2010-2050
- ➡ First 10 years of delivery being taken forward by integrated specialist team
- ➡ Thames Barrier: APF 0.7% assuming 5 times annual closure. By 2070, 70 times annual closure
- ➡ Downstream exposure of asset system, upstream complex composite structures
- ➡ Towards an ISO55000 accredited optimised replacement and adaptation regime



Numbers of Thames Barrier closures to prevent tidal or river flooding



**166**

Total number of flood defence closures since the Barrier was opened

**40**

Total number of flood defence closures so far in 2014

**20**

Number of consecutive flood defence closures up to Monday Feb 17 (the most consecutive closures on record)

# Managing risk: *practising* (1)

## ➔ Dawlish

- ➔ Scenario planning for 25km stretch of strategic south west rail network (built 1840)
- ➔ Sand spit recharge using dredge from local ebb delta
- ➔ Re-activation of dune processes and removal of damaging assets
- ➔ Improved storm sheltering for Exe estuary communities (2900 properties), infrastructure and SPA bird communities (numbering 93,000)



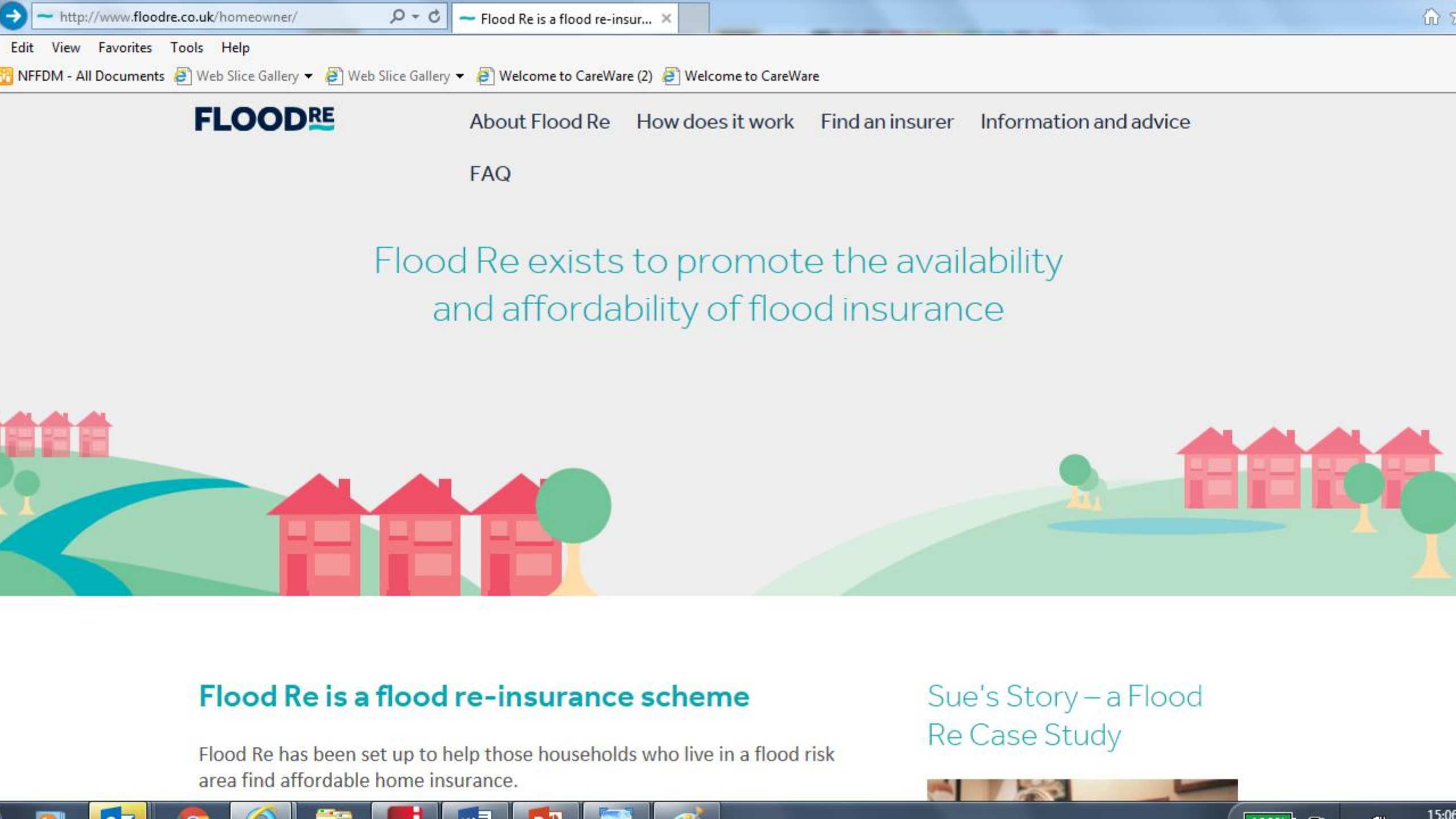


# Managing risk: *practising* (2)

- ➔ Clacton on Sea, Essex
  - ➔ £36 million to protect over 3,000 homes over 100 years
  - ➔ Partnership funding: £4 million combined local authority funding, £0.5million Growth Fund
  - ➔ 23 fish tail rock groynes, 950,000m<sup>3</sup> beach recharge
  - ➔ Towards regeneration...







[About Flood Re](#) [How does it work](#) [Find an insurer](#) [Information and advice](#)

[FAQ](#)

Flood Re exists to promote the availability  
and affordability of flood insurance



## Flood Re is a flood re-insurance scheme

Flood Re has been set up to help those households who live in a flood risk area find affordable home insurance.

Sue's Story – a Flood  
Re Case Study



# Forecasting in England



**FLOODFORECASTINGCENTRE**

*a working partnership between*



Environment  
Agency



Met Office



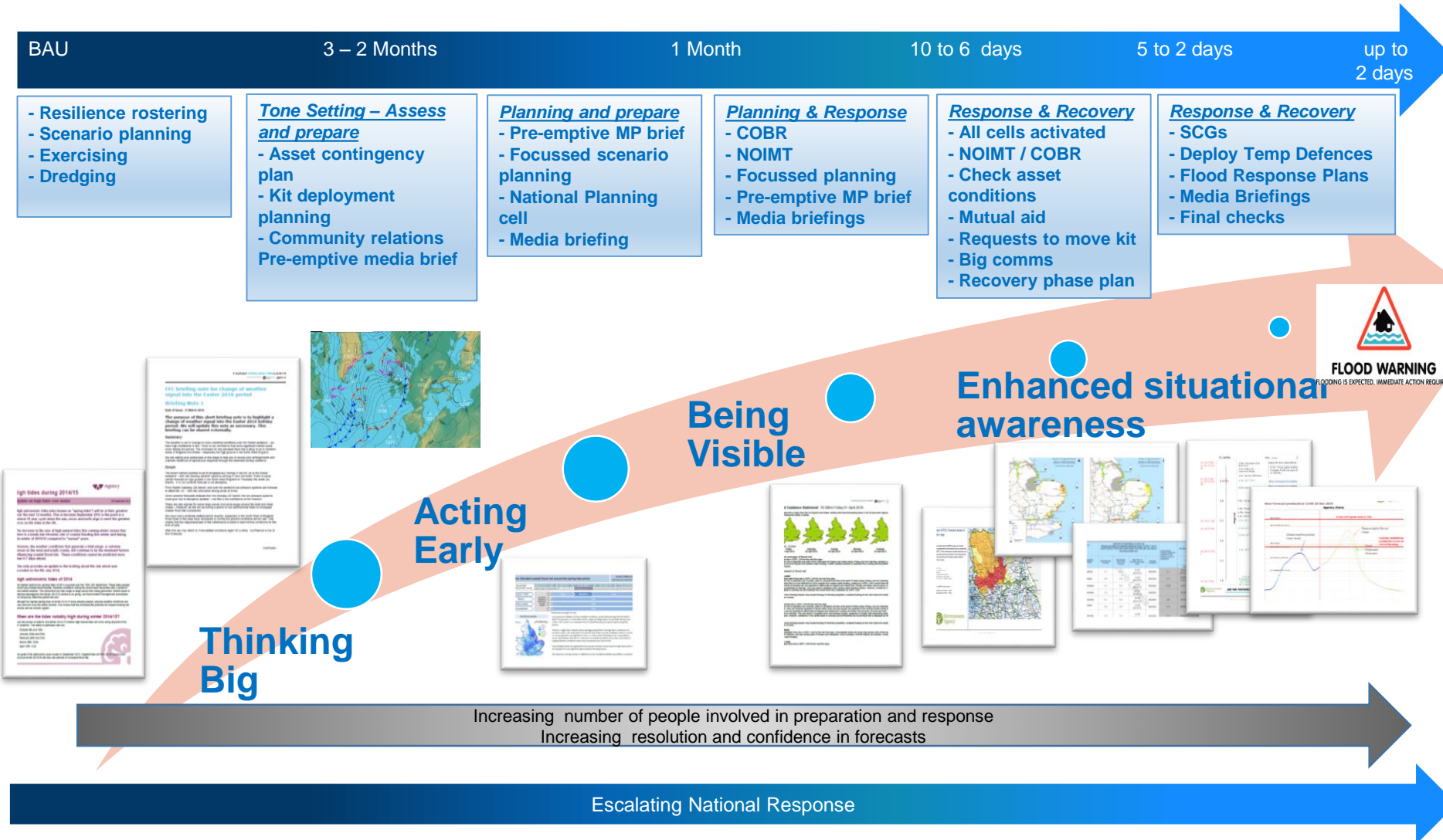
# Modelling & Forecasting

National Modelling and Forecasting Service delivered to local communities

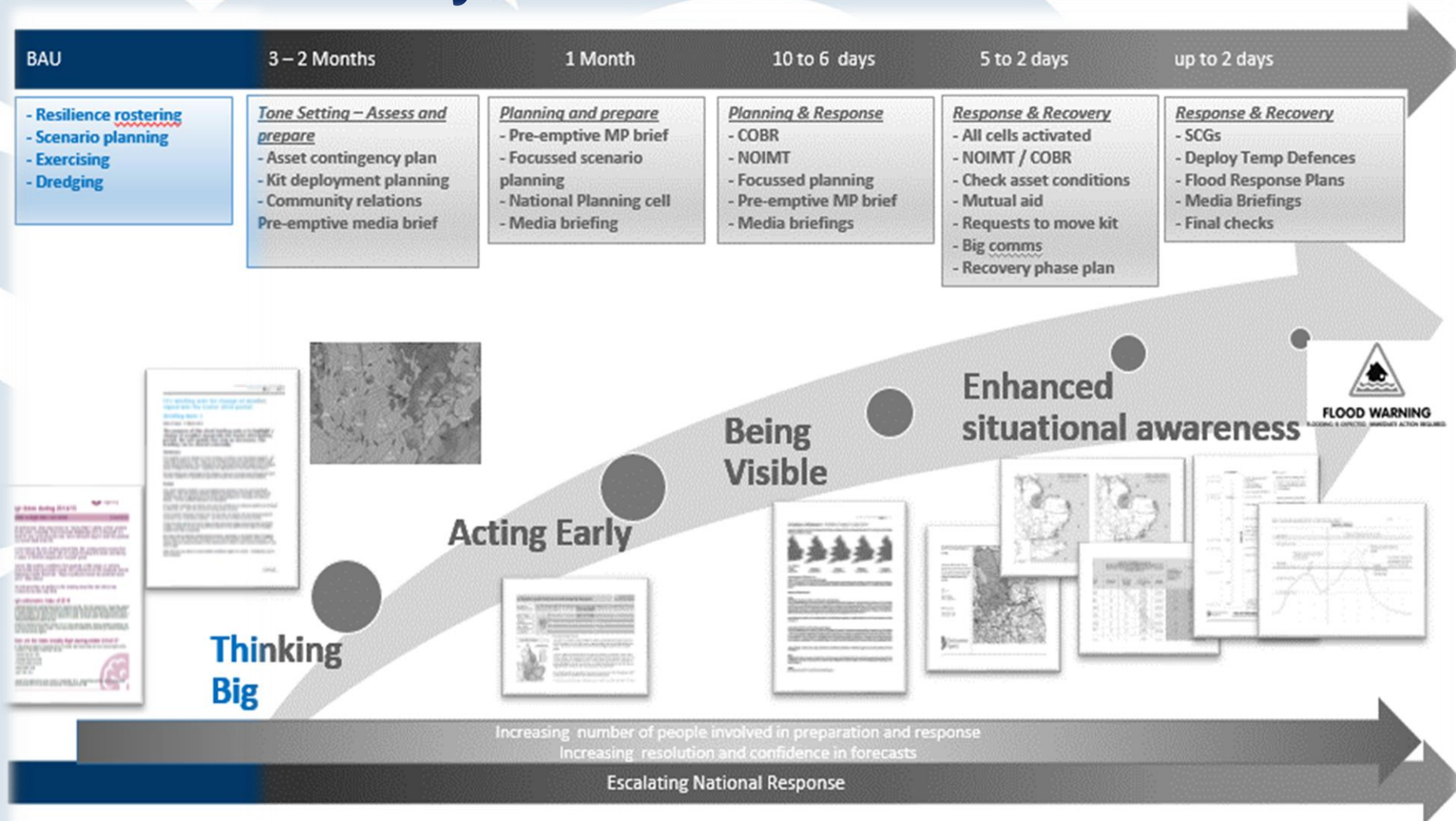
- National Forecasting service
- 7 Centres provide services to Areas
- Thames Barrier





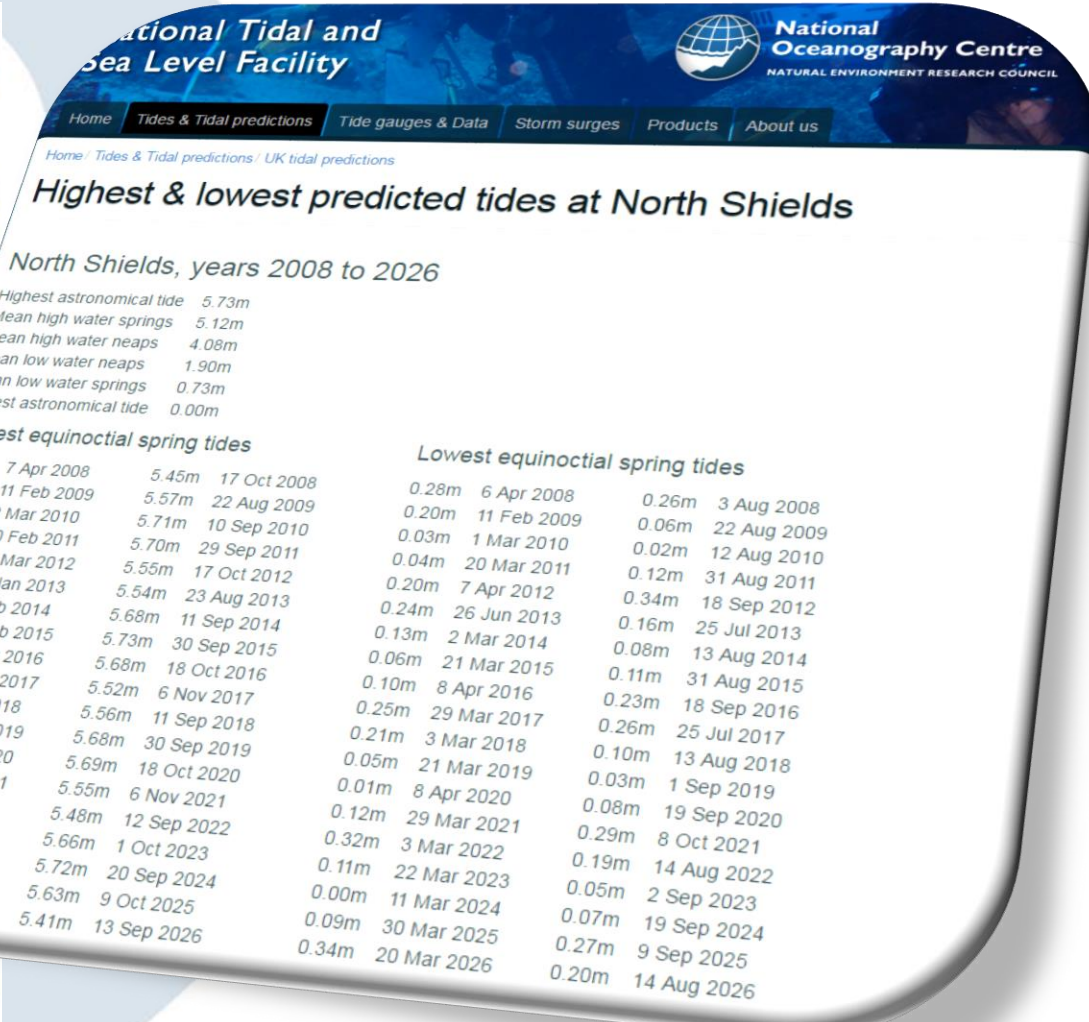
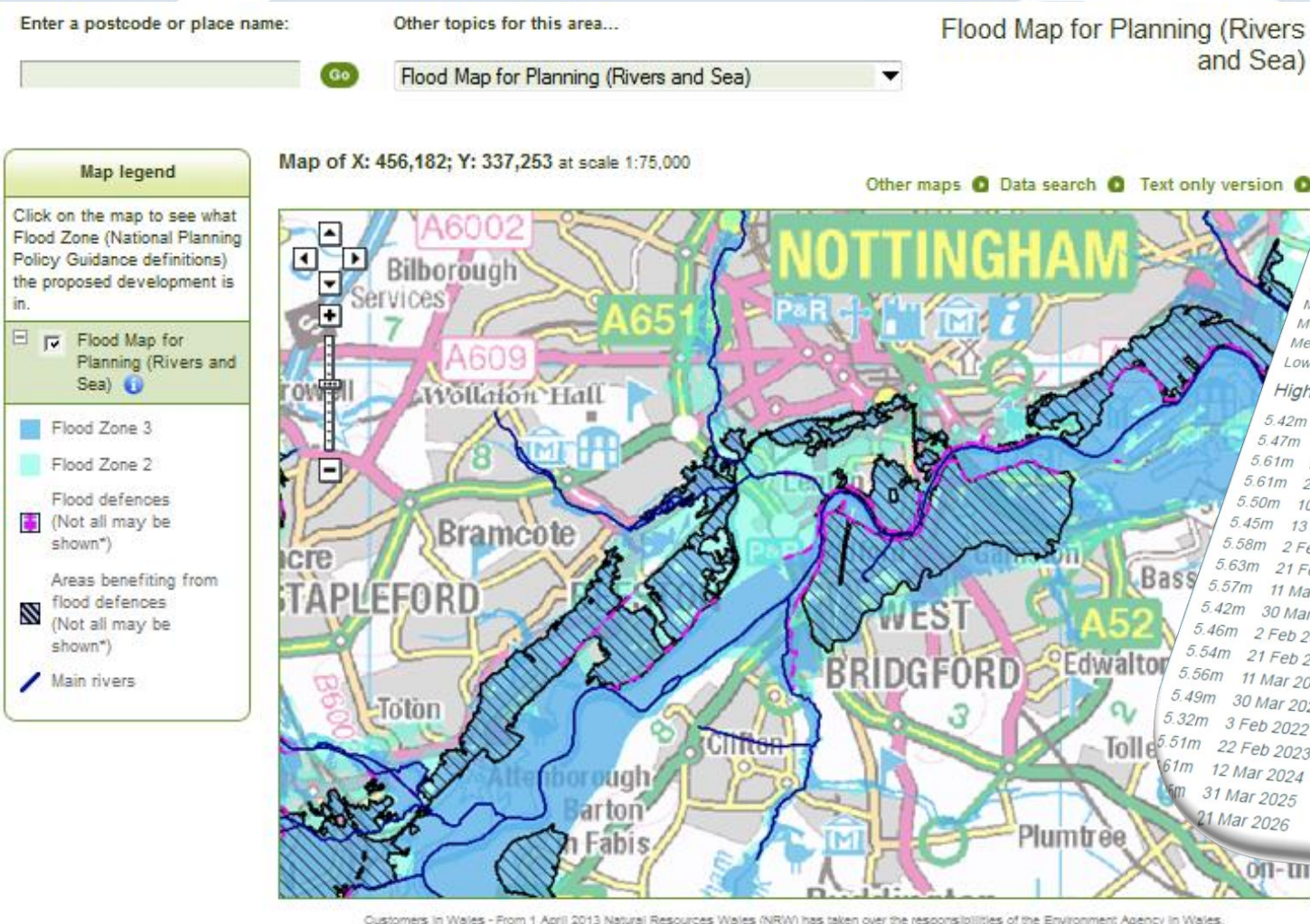


# BAU / beyond 3 months ahead



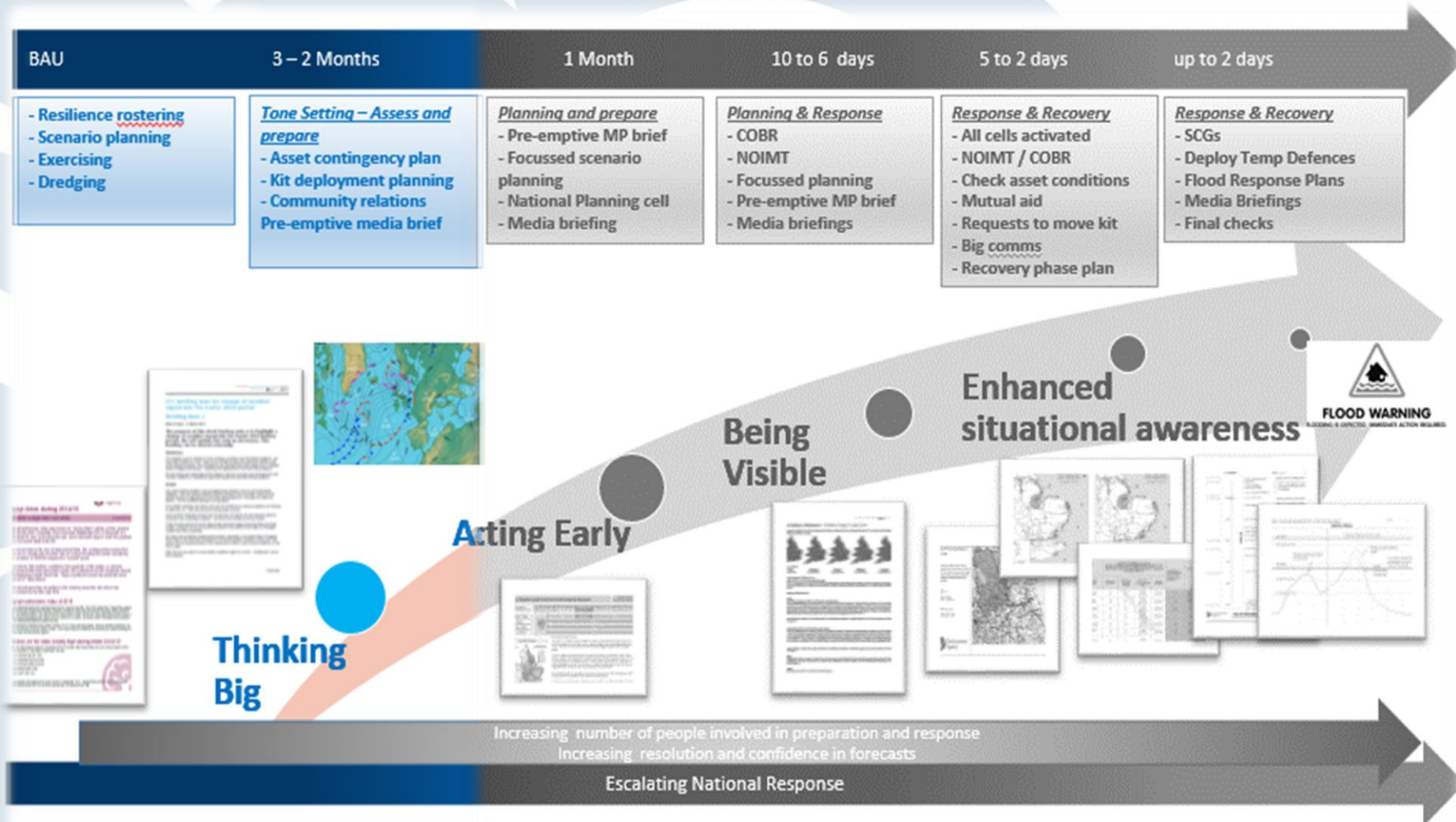


# Understanding risk

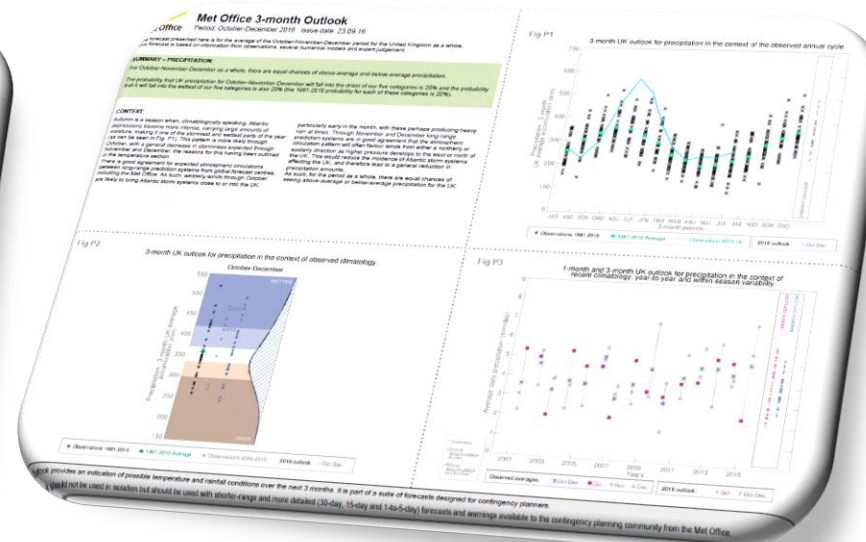
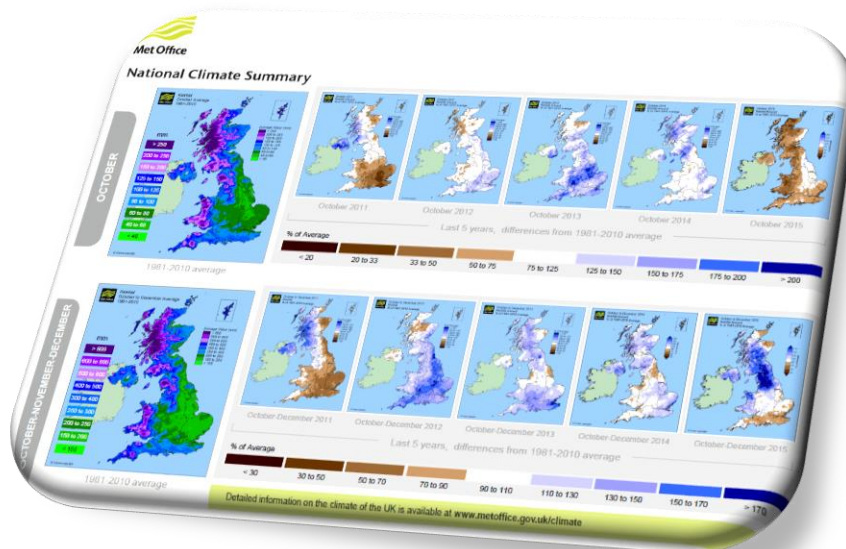




# 2 - 3 months ahead



# Met Office 3 month outlook



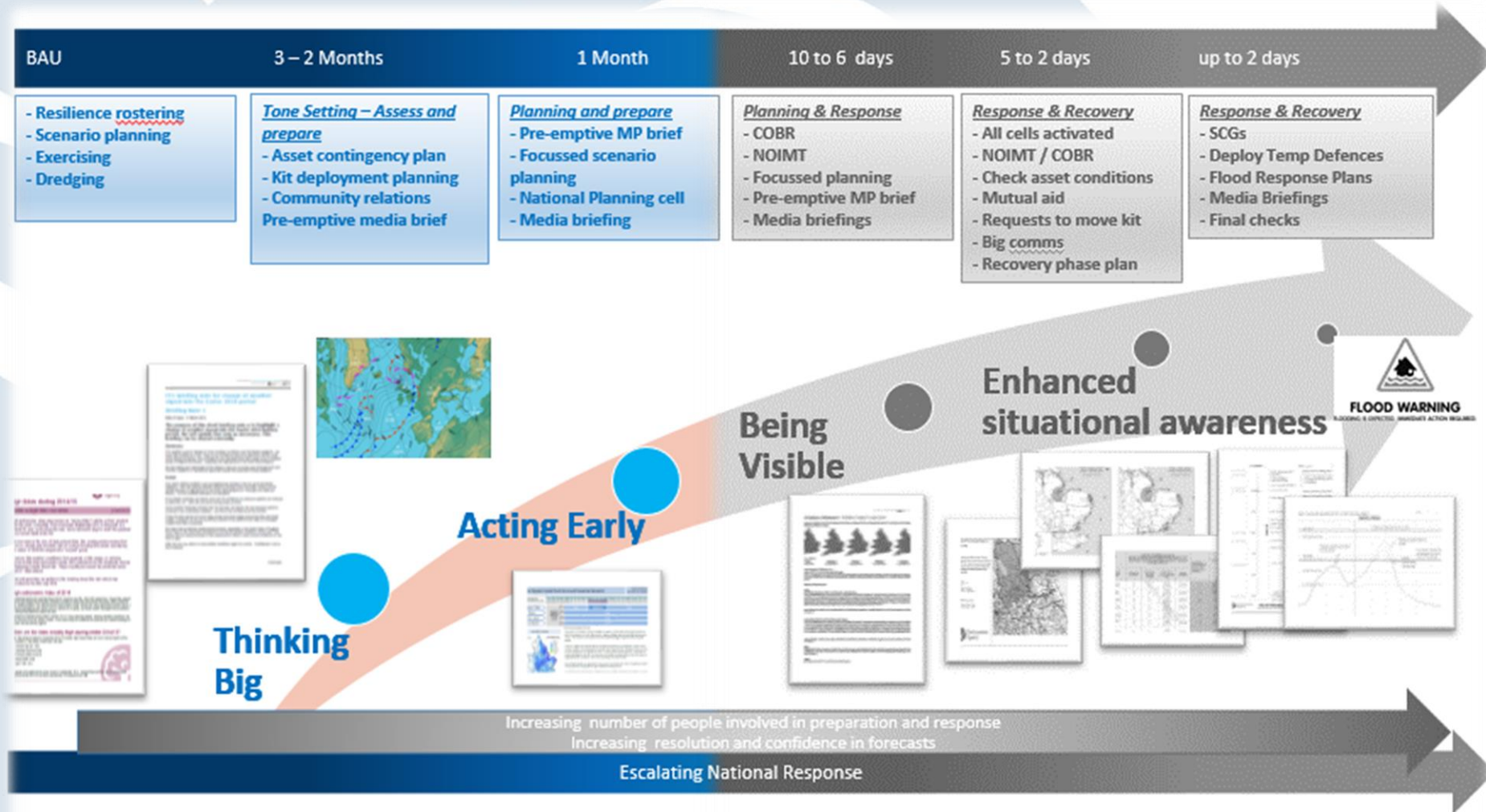
## SUMMARY – PRECIPITATION:

For October-November-December as a whole, there are equal chances of above-average and below-average precipitation.

The probability that UK precipitation for October-November-December will fall into the driest of our five categories is 20% and the probability that it will fall into the wettest of our five categories is also 20% (the 1981-2010 probability for each of these categories is 20%).

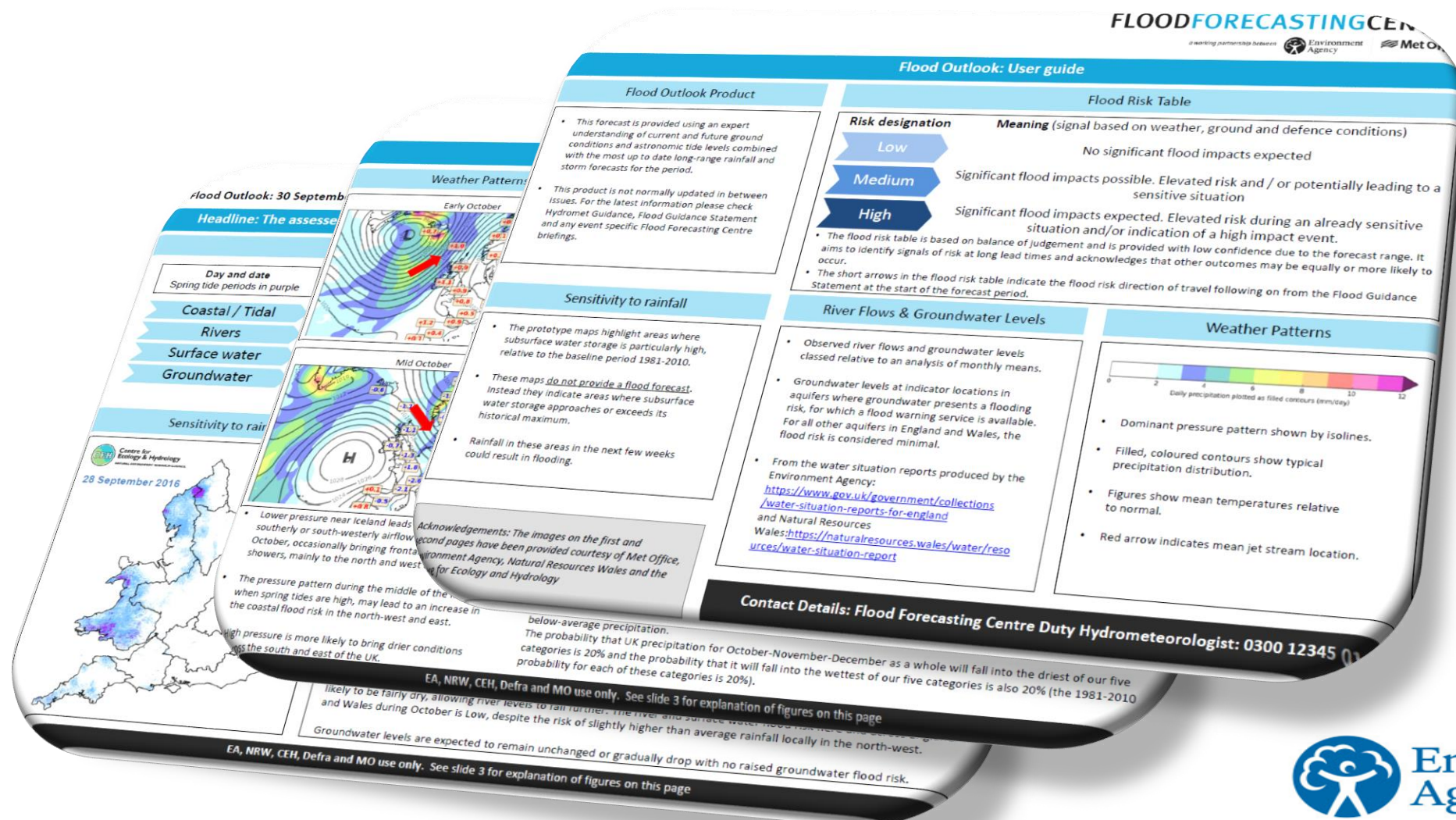


# 1 month ahead

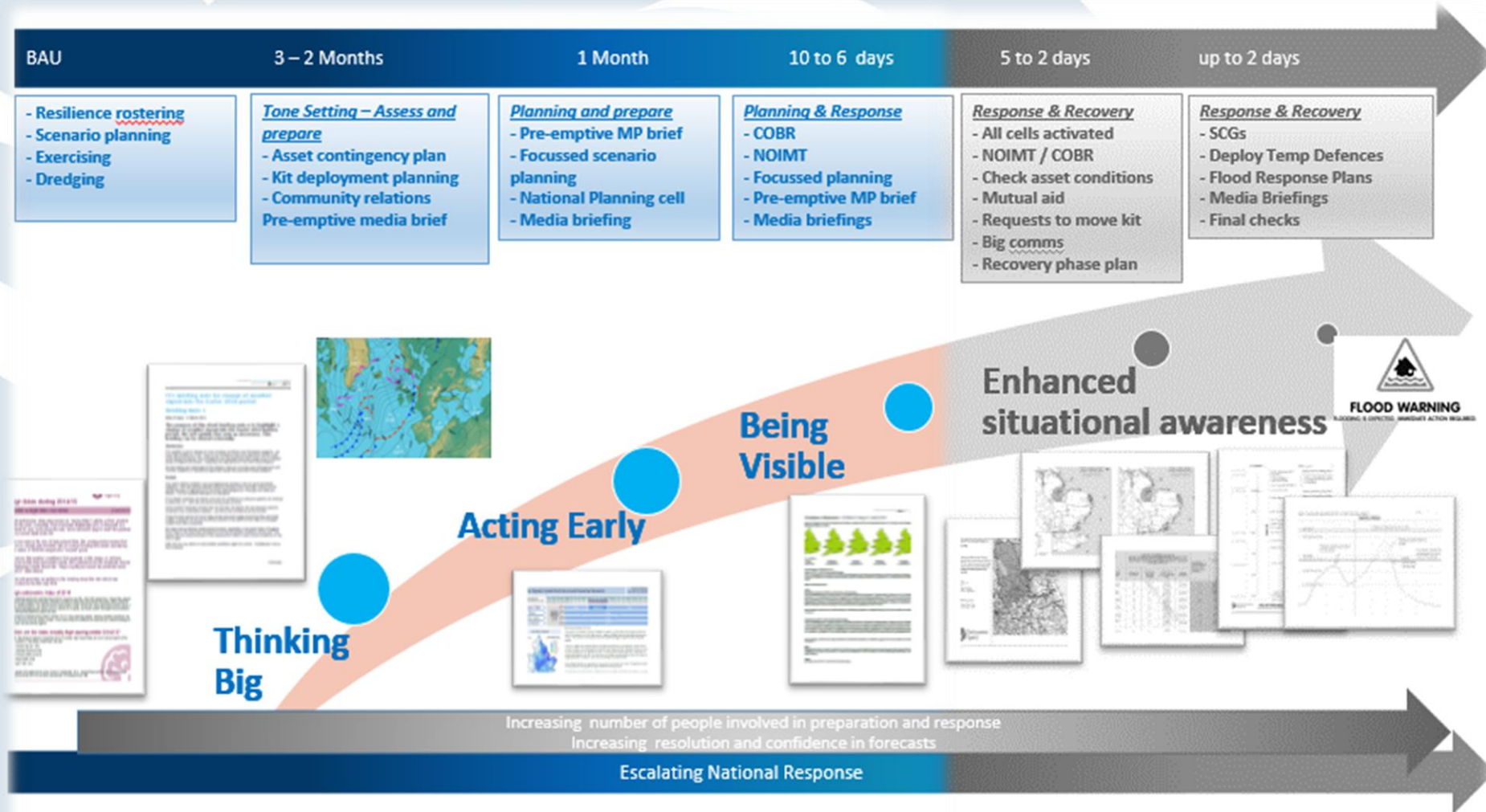




# Forecast Products – monthly outlook



# 6 – 10 days ahead





# National Duty Management

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## National Duty Management

[This briefing provides the operational picture on forward look at the weeks ahead. It contains content that might need to speak to.]

National Office is currently at ROUTINE Incident

1. Current incidents and risks
2. Longer term risks and horizon scanning
3. Contact details

### Current incidents and risks

#### Thames Barrier Annual Test Closure

The annual test closure of the Thames Barrier is scheduled for 30 September 2016 between 08.25 and 18.25, subject to the weather.

**Our assessment and response**  
Due to the potential public interest a HELP report is being proceeded.

**Area boundary changes:** As a result of the changes to the Area Boundaries a number national management products have been updated. Name changes in our new public facing products will start using these from Monday 3 October. The changes only relate to things that could not be reflected in some internal products have also been updated. Changes have included updating the HELM template, the National Slide Pack, the Area Boundary Briefing, Incident Alert Levels and the Rolling Brief.

The affected areas have updated things with accounts (you will see this reflected in our supporting documents have been updated).

**Note:** There are no current plans to update names.

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## National Duty Management

### Flood Risk

#### Flood Guidance Statement 10

Our assessment of daily flood risk for England and Wales, is below.

**The overall flood risk is LOW on Saturday**

**General overview of flood risk**  
The surface water flood risk is LOW on Saturday with heavy showers.

At 15:00hrs there were 0 Severe Flood Warnings.

### Longer term risks and horizon scanning

#### Flood Outlook

Please find separately attached an external forecast from the Met Office Forecasting Centre. There is a medium level of confidence in the forecast for the period of the October.

**Our assessment and response**  
The current forecast confidence is low but as confidence in the models improve. The forecast will be updated.

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## National Duty Management

### Industrial Action

There has been no change to the industrial action that was already planned and reported on last week and on Monday (14 days of Southern Rail strikes, October to December).

### Weather Outlook

#### Headline

Showery at first, but becoming more settled for most from Sunday.

#### General Overview Days 1 to 5

An area of low pressure is now moving east away from northern Scotland, which generated a positive surge down the east coast of England overnight and during this morning. Blustery showers on Friday; these most frequent across northern England and south-west of England.

Showers becoming frequent and organised on Saturday, mainly over the Midlands and Anglian, as a shallow area of low pressure drifts east across the UK. Ridge of high pressure building for Sunday and into Monday bringing dry conditions for most. Later on Monday and through Tuesday, a frontal system may sit over far western parts, but there is uncertainty in the movement of this front and no heavy rain is expected.

Astronomical tidal ranges peak over the weekend. However, no coastal issues are currently expected.

#### General Overview Days 6 to 10

High pressure is expected to lie to the east of the UK with low pressure over the North Atlantic. A good deal of dry weather can be expected, particularly across the east and south-east of England. Frontal bands of rain may edge into the west, but confidence in the movement of this rain is low. Later in the period, a change to more unsettled conditions, with periods of rain in the north and west, with the drier conditions further south and east.

Astronomical tidal ranges will reduce through the period. There is no strong signal at this stage of any significant coastal flood events.

The next routine NDM briefing will be issued on **Monday 3 October 2016**.

Regards  
Sharon Sawyer  
National Incident Management Team

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## FFC briefing note for the period 8 – 13 February 2016

### Briefing Note 1

Date of issue: 03 February 2016

**The purpose of this short briefing note is to highlight potential flood risk over the period which includes the next set of spring tides (08-13 February). We will update this note as necessary. This briefing can be shared externally.**

#### Headlines:

**The weather is forecast to be unsettled with the jetstream further south than the last couple of weeks – meaning that the chance of unsettled weather and winds driving coastal flood risk across England and Wales has increased.**

**Due to the height of the tides there are likely to be operational flood/tidal gate closures. The timing and depth of the low pressure systems will be critical in determining how the coastal flood risk evolves.**

**This also brings signals for potentially elevated flood risk for rivers and surface water across the north and west of England and Wales over this period, although nothing extreme is currently signalled.**

The period 08 – 13 February 2016 sees the next set of spring tides which occur on a 4 weekly basis. Because the weather is forecast to be unsettled over this period the coastal flood risk is assessed as above normal. There is currently no signal for extreme coastal flooding – but we will keep a close watching brief on the situation. The key will be the interaction of the weather systems over the times of high tide in this period.

The unsettled weather will also bring an increased risk of river and surface water flood risk – but again nothing extreme is signalled at this stage.

The Flood Guidance Statement is currently Green for the five days from today (03 – 07 February 2016). Next week this could change as the flood risk is assessed.

In summary there is no signal for major flooding at this stage over the spring tide period. However, the weather is likely to be unsettled which does lead to an above normal assessment of flood risk.

If over the next few days the FFC is concerned about more elevated flood risk more information will be shared through the usual channels.

We will update this briefing note if required – the Flood Guidance Statement and Environment Agency / Natural Resources Wales Flood Warnings should be used for the latest assessment.

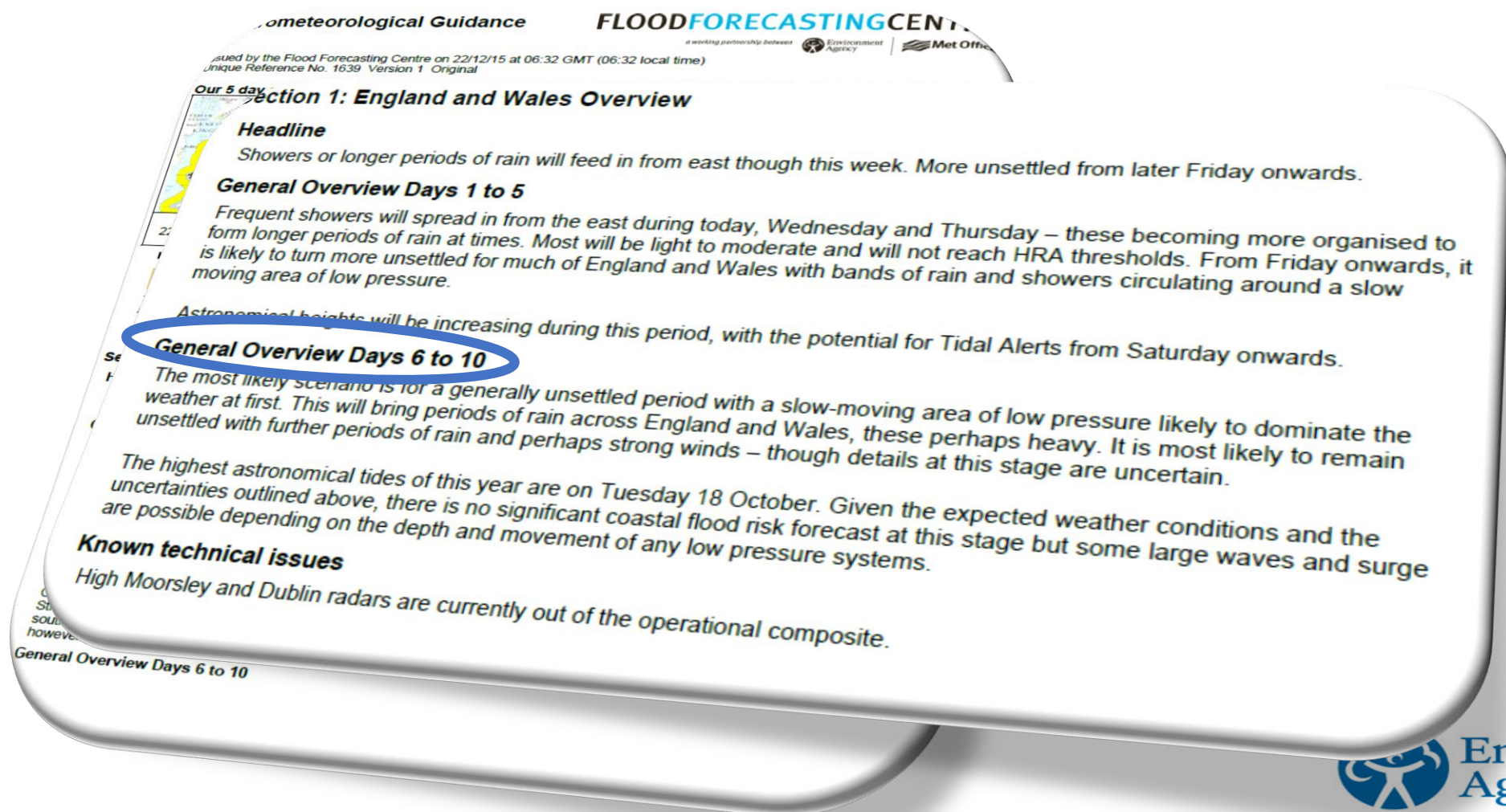
Brian Vinall – Operations Senior Team Leader

Flood Forecasting Centre

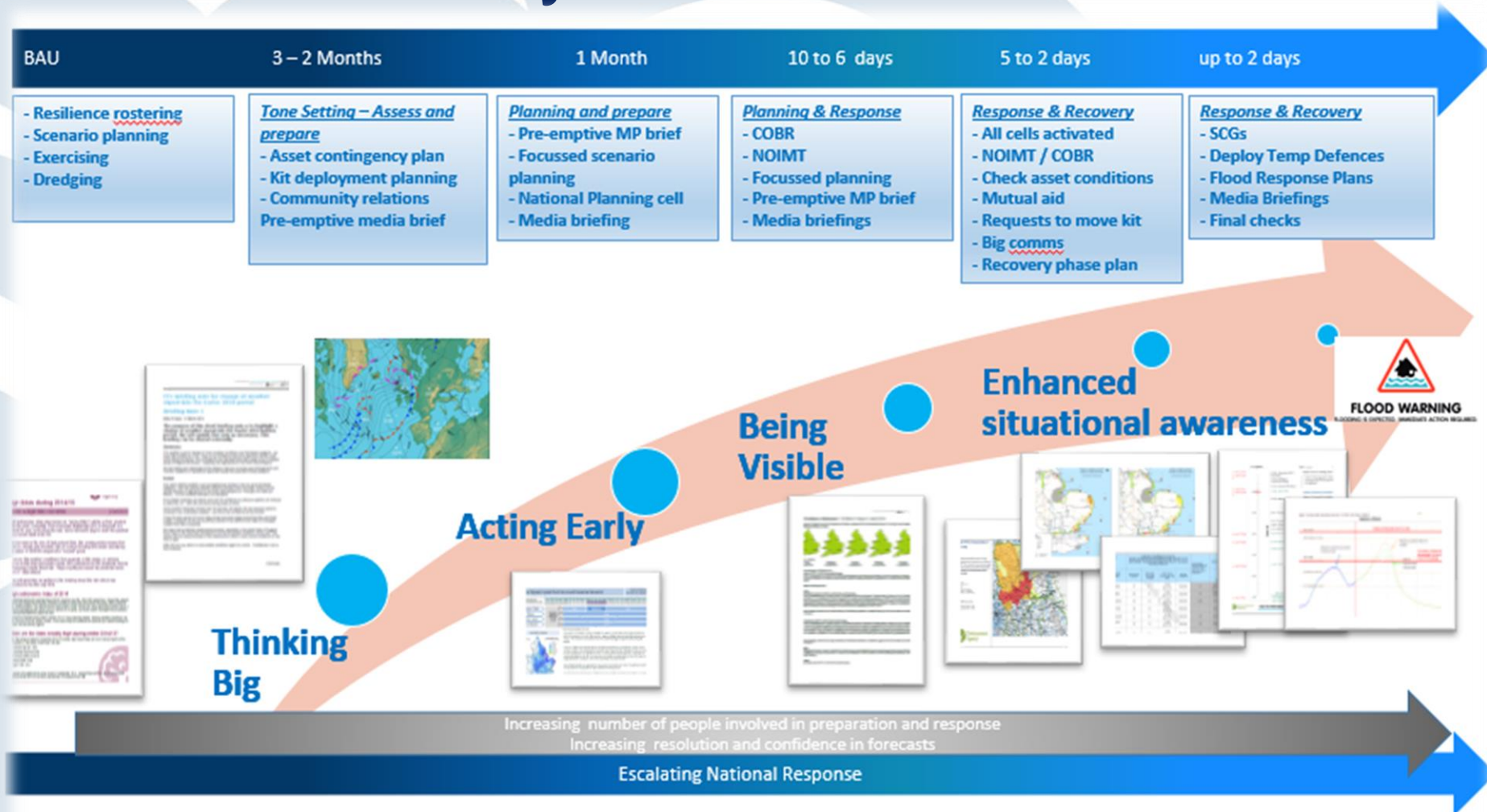
Telephone: 0300 1234501 (24 hours)

Continued...

# Hydromet Guidance

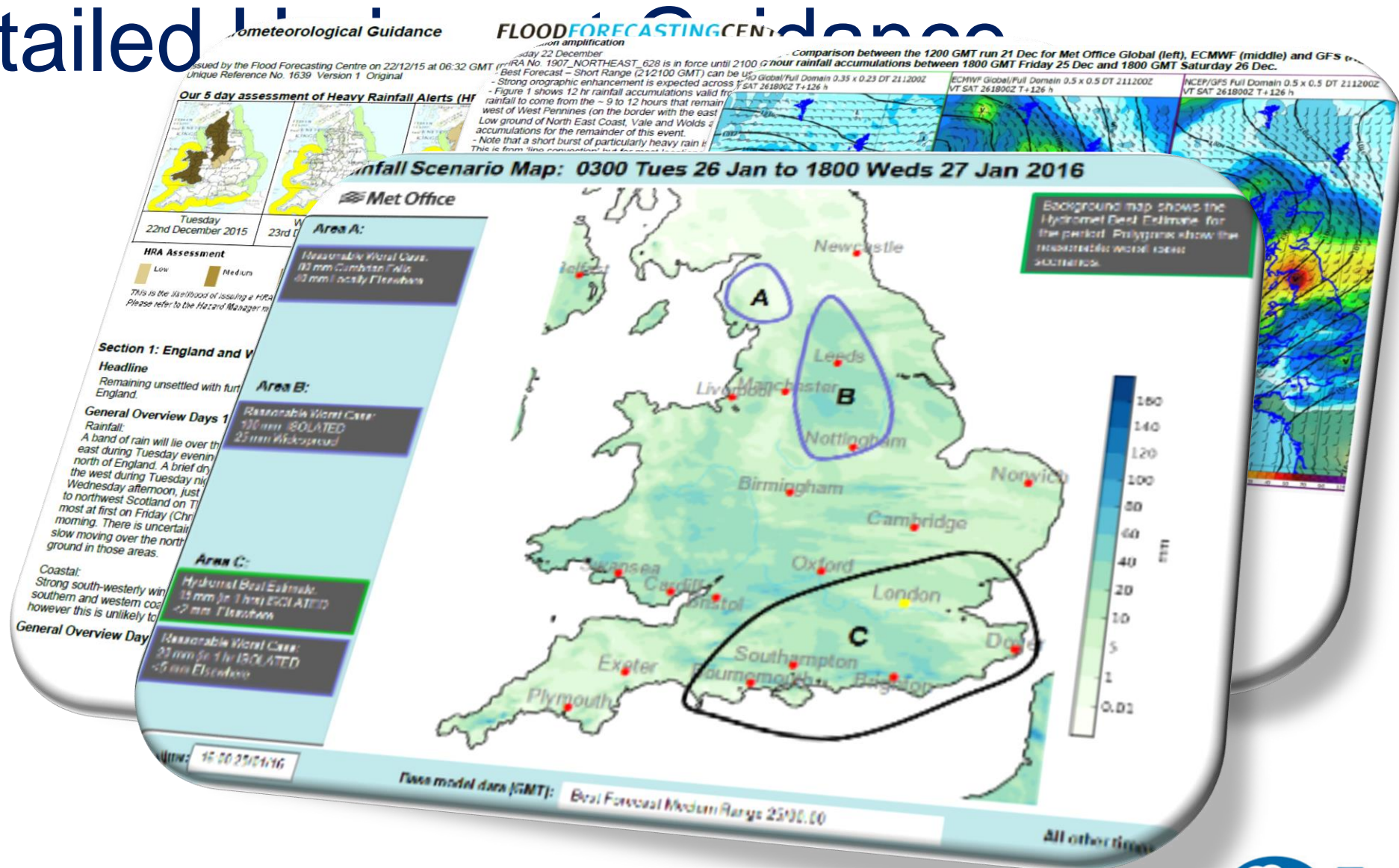


# Out to 5 days ahead





# Detailed Meteorological Guidance



# Forecast Meteorological Data

East Meteorological Data  
North East Region

FLOOD FORECASTING CENTRE  
a working partnership between  
Environment Agency Met Office

issued by the Flood Forecasting Centre on 22/12/15 at 05:12 GMT (05:12 local time)  
Unique Reference No. 3132 Version 1 Morning Issue

Precipitation Forecast Days 1 and 2

		Tuesday 22/12/15					Wednesday 23/12/15			
		00-06 (GMT)	06-12	12-18	18-24	Day 1 Total (06-24)	00-06	06-12	12-24	Day 2 Total (00-24)
CVHT	Ave (mm)		17	1	2	20	4	0	0	4
	Max (mm)		26	2	6	29	8	1	1	8
WPN	Ave (mm)		24	6	0	30	3	0	0	3
	Max (mm)		41	12	1	51	5	1	1	(9) 5
CNP	Ave (mm)		13	5	0	18	4	0	0	4
	Max (mm)		24	9	1	32	7	1	1	7
SPN	Ave (mm)		4	8	1	13	5	0	0	5
	Max (mm)		10	15	4	23	9	0	1	(4) 9
NEC	Ave (mm)		6	1	1	8	3	0	0	3
	Max (mm)		14	2	5	18	7	1	0	(5) 7
MOOR	Ave (mm)		1	2	0	3	1	0	0	1
	Max (mm)		2	5	0	5	2	1	0	(7) 2
VWD	Ave (mm)		1	3	1	5	3	0	0	3
	Max (mm)		3	8	2	9	5	1	0	(4) 5

CVHT	Cheviot	WPN	West Pennines
CNP	Central & Northern Pennines	SPN	South Pennines
NEC	North East Coast	MOOR	Moors
VWD	Vale & Wolds		

Notes: All precipitation values are given as rainfall equivalents  
Ave: Best estimate of mean rainfall depth over the Area during the period.  
Max: Best estimate of maximum rainfall depth at any one location in this time period, this is not an extreme value.  
Model Output: A number in brackets shows the original model output value. The number below this, is the FFC's Hydrometeorologists' interpretation.

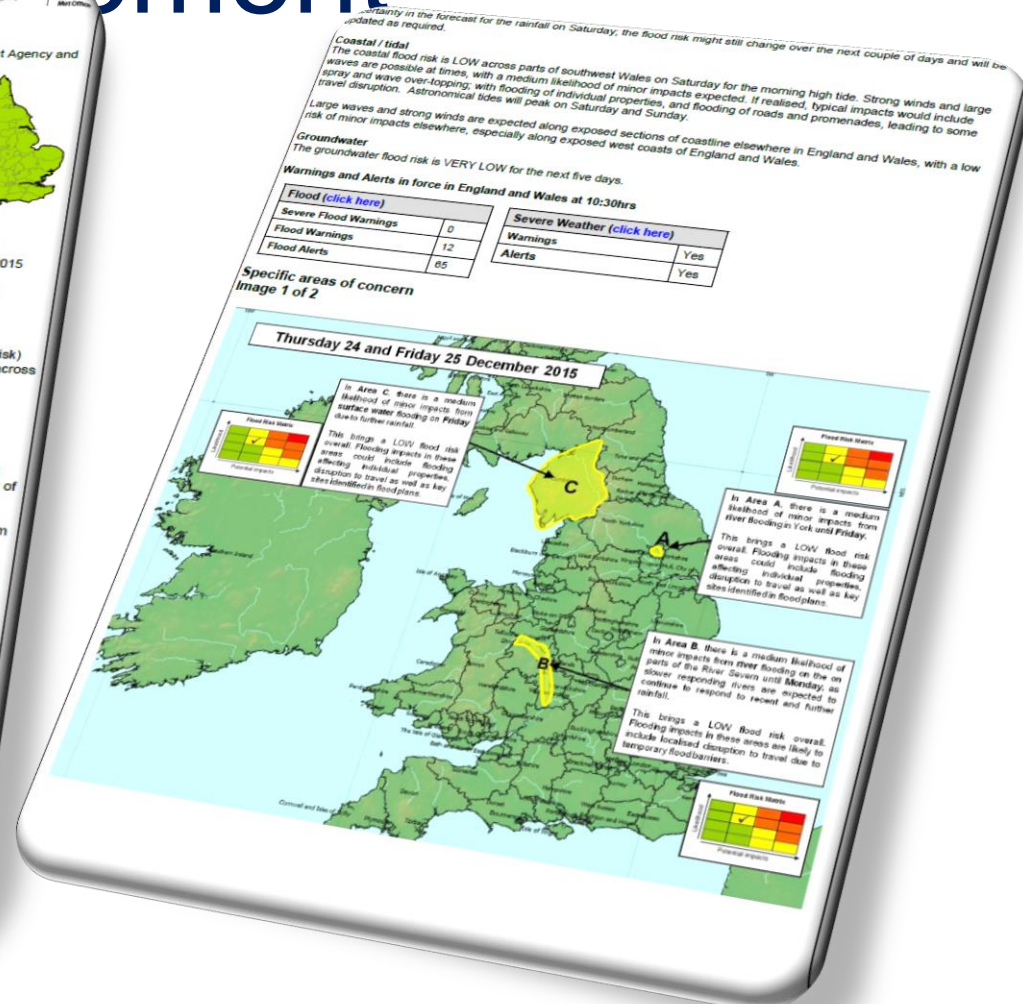
**Daily Summary Days 1 - 5**

		Tuesday 22/12/15	Wednesday 23/12/15	Thursday 24/12/15	Friday 25/12/15	Saturday 26/12/15
Precipitation	Ave (mm)	See table above				
	Max (mm)	12 34 19				
Temperature	Min (degC)	1	-1	-2	-1	2
	Max (degC)	15	9	11	13	14

Hydrometeorologist: dave.cox, Tel: 0300 12345 01



# Flood Guidance Statement





Loc

23 December 2015

## Local Flood Outlook

### National Modelling and Forecasting Service delivered to local communities

#### Yorkshire

Forecast start date: **Wednesday 23 December 2015**

Scenarios Included: Coastal, Tidal and River

#### Headline

High river levels will start to fall later Wednesday and through Thursday. Late Christmas day and through Boxing day could see conditions that would result in a return to widespread alerts and warnings being in place. Confidence in the rainfall forecast and therefore details of river response is low at present. It is likely that boxing day will be disrupted by incident response.

#### Outlook for Days 1 - 2

##### Weather

- No further significant rainfall is forecast for the Area until later on Friday.
- There will be some showers passing over Area this morning and then Wednesday is mostly dry
- A weather front will through the Area West to East on Thursday morning but will not result in any rainfall totals of concern. There is the potential for line convection to occur on the front. This may have the effect of short duration heavier rainfall occurring in the frontal rain as it passes over the Area which could result in a rapid rise in some smaller catchments. If this line convection does occur however it will not result in significant accumulations of rainfall in any one location and is still not expected to cause any flood thresholds to be crossed.

•

##### Rivers

- Upper catchments in YNE have peaked and are now falling. Lower parts catchments feeding the Ouse system are due to peak today and then fall.
- There is no concerns in YS&W for the next 2 days
- There will be a limited response in river levels to the frontal rainfall on Thursday. Rivers are not expected to rise above alarm thresholds as a result of the front on Thursday. The effect will be to keep catchments wet.
- The main effect of the rainfall on Thursday will be that the Upper Ouse may not get much below alarm level before further rainfall through Christmas day and Boxing day results in a further and potentially significant rise in river levels throughout the lower Ure, Swale, Nidd and Upper Ouse.

##### Coastal/Tidal

- A persistent positive surge is expected to remain present on the east coast. This is not forecast to cause any significant coastal issues.
- However the presance of a reaonably large positive surge between astronomic high tides will slow the evacuation of water from the tidal parts of catchments and could complicate the flood risk in the next few days in tidal locations.
- Winds will be strong but from a southerly and offshore direction and so are favourable for reducing flood risk along the coast.
- Despite this a few flood alerts are likely to be triggered at the frequently issued locations.

##### Other

No other systems issues.

23 December 2015

## Local Flood Outlook

### Local Forecasting Scenario summary for Yorkshire

#### Part1: MFDO's Best Estimate

River Scenario Basis		As per FFC BE guidance		
Summary Rivers		Number of alerts/warnings expected Flood Alerts	Flood Warnings	Forecasting Operational Thresholds
Day 1	Wed 23 Dec 15	16-20	21-25	0
Day 2	Thu 24 Dec 15	3-5	3-5	0
Day 3	Fri 25 Dec 15	3-5	3-5	0
Day 4	Sat 26 Dec 15	16-20	16-20	0
Day 5	Sun 27 Dec 15	6-10	11-15	0

#### Comments

Day 1&2 - number of warnings expected to reduce from day 1 today from mid Wed onwards The high number reflects what is out at the timing of writing. Northing new expected on day 1&2 from that already out.

#### Days 3-5

Widespread alerts likely. Depending on the timing of issue the numbers on day 3&4 could be the same for flood alerts.

Ops Thresholds omitted as MFDO does not relieve alarms for these for the most part.

#### Locations

All Pennine draining rivers in North Yorkshire would be affected.

Less likely that the Aire and Calder will be impacted but as rainfall is highly uncertain then this cannot be ruled out. If the Calder is impacted then the number of Warnings will be much higher than suggested here.

Coastal/Tidal Scenario Basis		Standard forecast data used as best estimate		
Summary Coast		Number of alerts/warnings expected Flood Alerts	Flood Warnings	Forecasting Operational Thresholds
Day 1	Wed 23 Dec 15	1-2	0	1-2
Day 2	Thu 24 Dec 15	1-2	0	1-2
Day 3	Fri 25 Dec 15	1-2	0	1-2
Day 4	Sat 26 Dec 15	1-2	0	1-2
Day 5	Sun 27 Dec 15	1-2	0	1-2

#### Comments

Bridlington as usual will be highlighted for the next 5 days

#### Locations

Not a concern but the a locations would be the Bridlington Alert and Selby Lock Gates Ops.

**INTERNAL USE ONLY**

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**INTERNAL USE ONLY**

# Tidal / Heavy Rainfall

## Heavy Rainfall Alert

### EA North East Region

Issued by the Flood Forecasting Centre on 24/12/15 at 17:06 GMT (17:06 local time)  
Unique Alert Reference No. 1909\_NORTHEAST\_630 Version 1

**ORIGINAL**

Start of meteorological event: 1200 GMT on 25/12/15  
End of meteorological event: 0200 GMT on 27/12/15

**Summary of Alert Criteria Met**

Alert Criteria	HRA Areas covered
10 mm (or more) in 1 hours (or less)	
15 mm (or more) in 6 hours (or less)	Cheviot, North East Coast, West Pennines, Central & Northern Pennines, South Pennines, Moors, Vale & Wolds
40 mm (or more) in 12 hours (or less)	Cheviot, West Pennines, Central & Northern Pennines, South Pennines

**Notes:**

- Confidence:** The probability of this threshold being achieved anywhere in the specified Heavy Rainfall Alert. H = more than 60%; M = 40 – 60%; and L = 20 – 40%. Issue of a Heavy Rainfall Alert means the probability of rainfall thresholds being met in the bands indicated by the confidence levels above. All Alert criteria should be defined in this table. If it is predicted that some criteria will

## FLOODFOR

Working ports

**Heavy Rainfall Information**

HRA Areas	10mm in 1 hour			15mm in 6 hours			40mm in 12 hours			Event Rainfall (mm)	
	Ave	Max	Time (GMT)	Ave	Max	Time (GMT)	Ave	Max	Time (GMT)	Ave	Max
Cheviot				10	25	18:00				30	60
North East Coast				8	20	17:00				20	40
West Pennines				15	40	16:00	20	60	23:00	40	120
Central & Northern Pennines				15	30	16:00	15	50	23:00	40	120
South Pennines				10	25	16:00	15	50	23:00	30	80
Moors				8	20	17:00				20	40
Vale & Wolds				8	20	17:00				10	30
Timing Uncertainty (+/- hours)						3			3		

**Notes:**

- Rainfall Ave:** Best estimate of mean rainfall depth over the specified HRA Area during the period of the given Alert criterion according to the confidence level indicated.
- Rainfall Max:** Best estimate of maximum rainfall depth over the specified HRA Area during the period of the given Alert criterion according to the confidence level indicated.
- Time:** Estimate of the time by which the given Alert criterion will be met in the specified HRA Area.
- Event Rainfall Ave:** Best estimate of mean rainfall depth over the specified HRA Area during the period of the meteorological event.
- Event Rainfall Max:** Best estimate of maximum rainfall depth at any one location in the time period of the meteorological event.
- The Alert criteria that have been defined in the first table are the only ones to be detailed in the second table.
- The boxes for HRA Areas with no Alert criteria breaches should be greyed out.
- Uncertainty - refers to the confidence in the timing of the Alert criteria being met. It is presented in +/- hours.

**Amplification:**

- Rain will arrive from the southwest around lunch time, spreading north-eastwards.
- This will be accompanied by strong southwesterly winds. This will act to enhance rainfall amounts along south-west facing upslopes.
- The rain will form into a band which will become fairly slow moving at times.
- Best Forecast - Short Range (240900) and Best Forecast - Medium Range (241200 GMT) are providing reasonable guidance, and can be used with medium confidence overall.
- Note that the greatest uncertainty is surrounding position of the highest rainfall amounts. The spot totals as forecast with the models has fairly high confidence, but it is the position of these highest totals which has been changing slightly from run-to-run.
- There is also large uncertainty regarding the threshold breach time. There is a signal for the threshold breaches in the evening on Christmas Day, and/or perhaps again in the early hours of Saturday morning.
- As such, this HRA may be updated, where appropriate.

meteorologist: emma.compton, Tel: 0300 12345 01

Each HRA Area is coloured according to the probability of its threshold being breached:

- Low (20 - 39%)
- Medium (40-50%)
- High (>= 60%)



Nation

## 'FULL+' Contents

### Headlines

Best estimate used by:  
National Flood Forecasting Duty Manager  
DAY DD MONTH 20YY, HH:MM

River Flooding Outlook  
Best Estimate  
Day DD – Day DD Month YY



Reasonable  
country.

Impacts from  
rivers such  
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of much mo

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communitie  
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forecasting

Locations t  
and Suffolk  
thresholds

Least risk  
likelihood

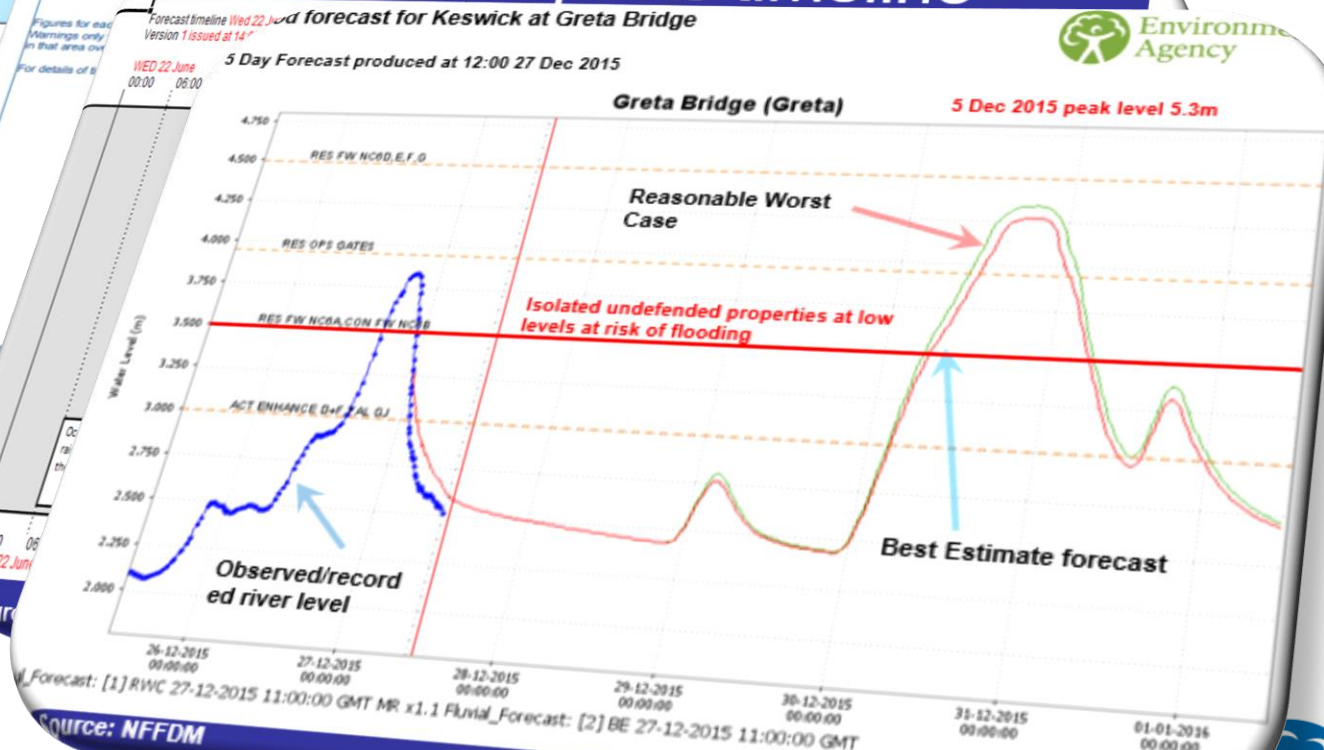
\*RWC rain  
• Widespre  
• Localised

Source: N

### River forecast and Benchmarks – [AREA(s)]

### Flood impacts map

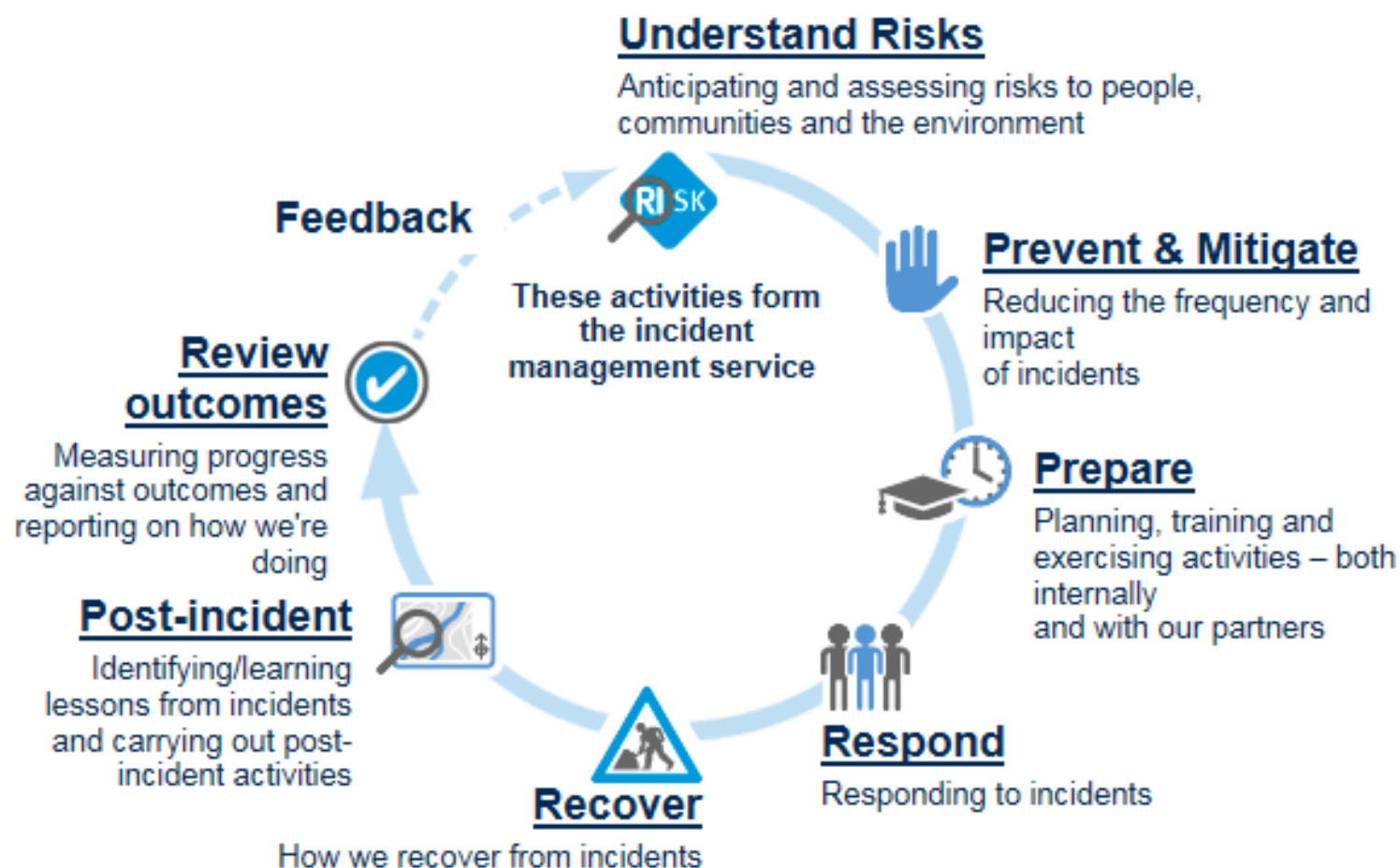
### Flood impacts timeline





# Incident management

This diagram shows the steps we go through as an organisation to manage any incident – including flooding, pollution or drought. any step below to find out more



Thank you