DELIVERING CLIMATE - RESILIENT PLACES

Climate Change in Flood Risk Assessment

CIEEM Conference
Stirling
September 2019

SEPA
Scottish Environment Protection Agency
Buidheann Dìon Àrainneachd na h-Alba


WHY AM I
HERE?

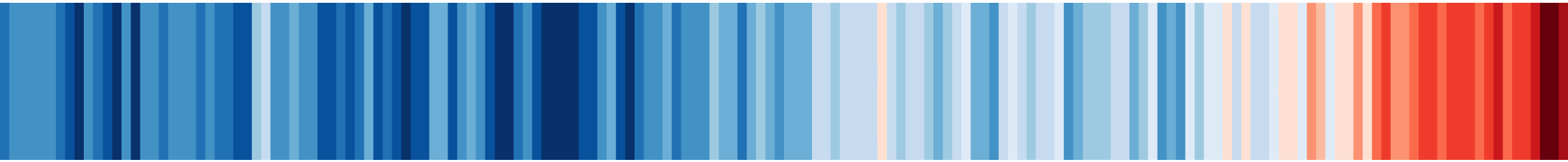
Brief background …

- SEPA statutory consultee in planning process
- FRA produced by applicant when new built development is known/suspected to be at flood risk
- SEPA assess FRA when consulted
- Previous guidance – 20% allowance for cc

New guidance - key points

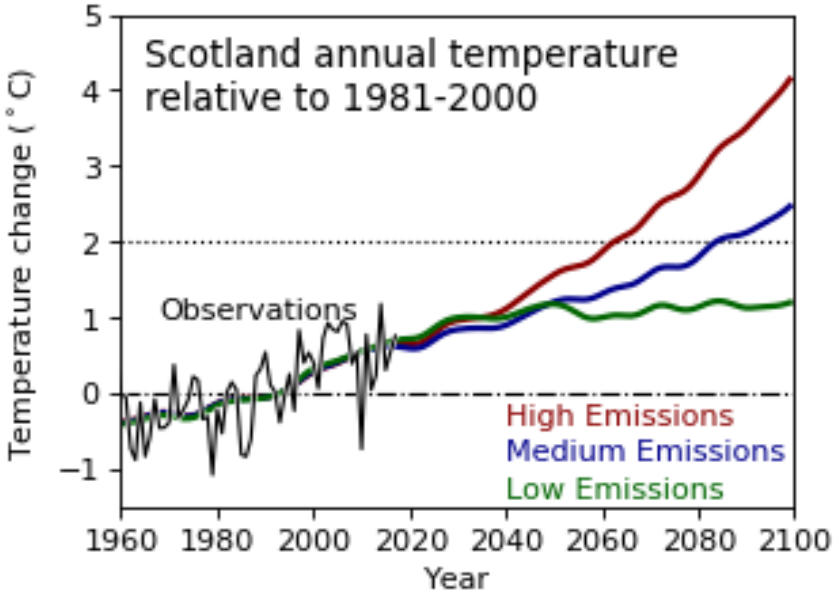
- **Big step forward for SEPA - supersedes previous 20% approach**
- **Underpinned by best science available to us**
- **Scotland focus**
- **Regionally varying**

Our planet is warming …



Annual global temperatures 1850-2017 (range 1.35 °C)

- Global temperature has increased over 1 °C since 1990 - more warming will occur
- Warmest 20 years in UK records have been since 1995 - warmest 5 this decade
- Even in most conservative emissions scenario, UK annual temperature projected to rise
- Cannot avoid impacts with emission cuts.



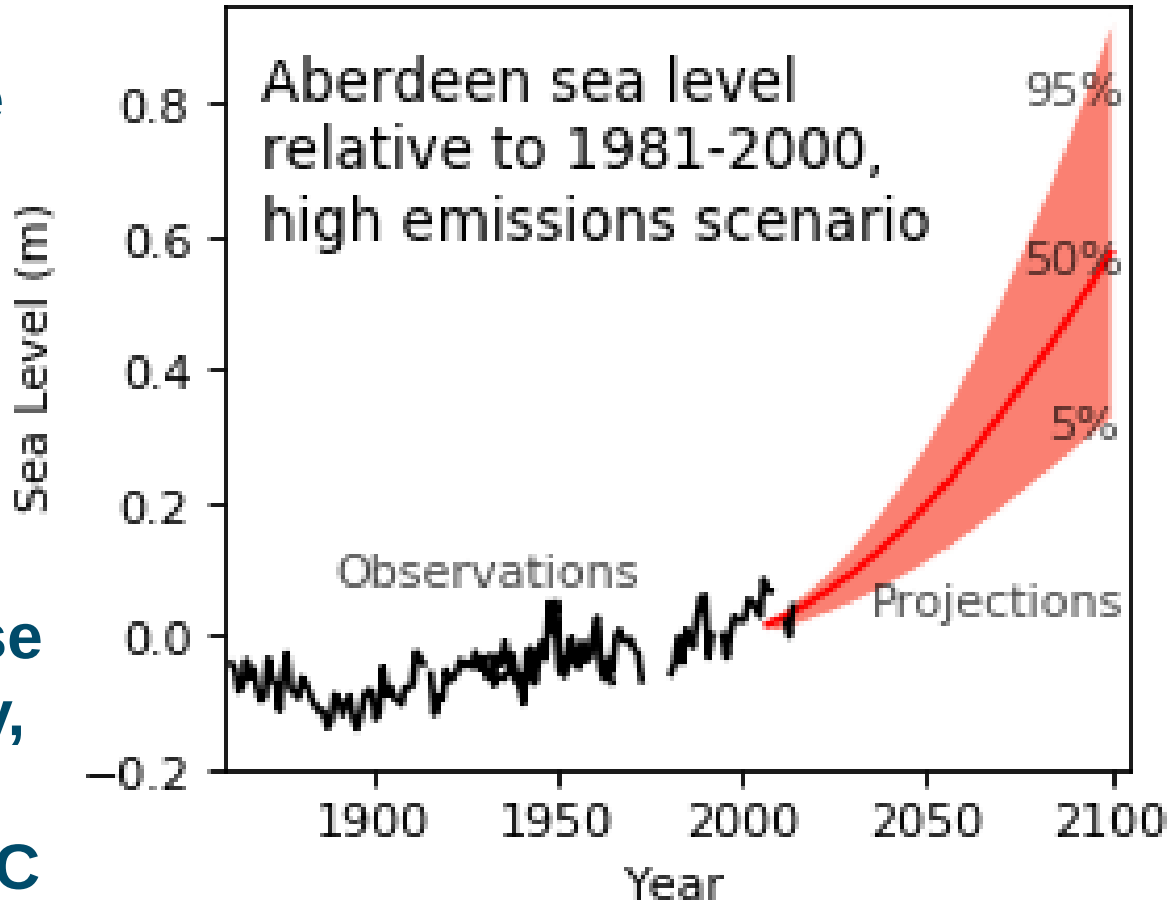
… and Scotland's climate is changing

- **The temperature in the 2000s was 0.9°C warmer than the 1961-1990 average,**

- **Annual rainfall has increase by 11% over the past century,**

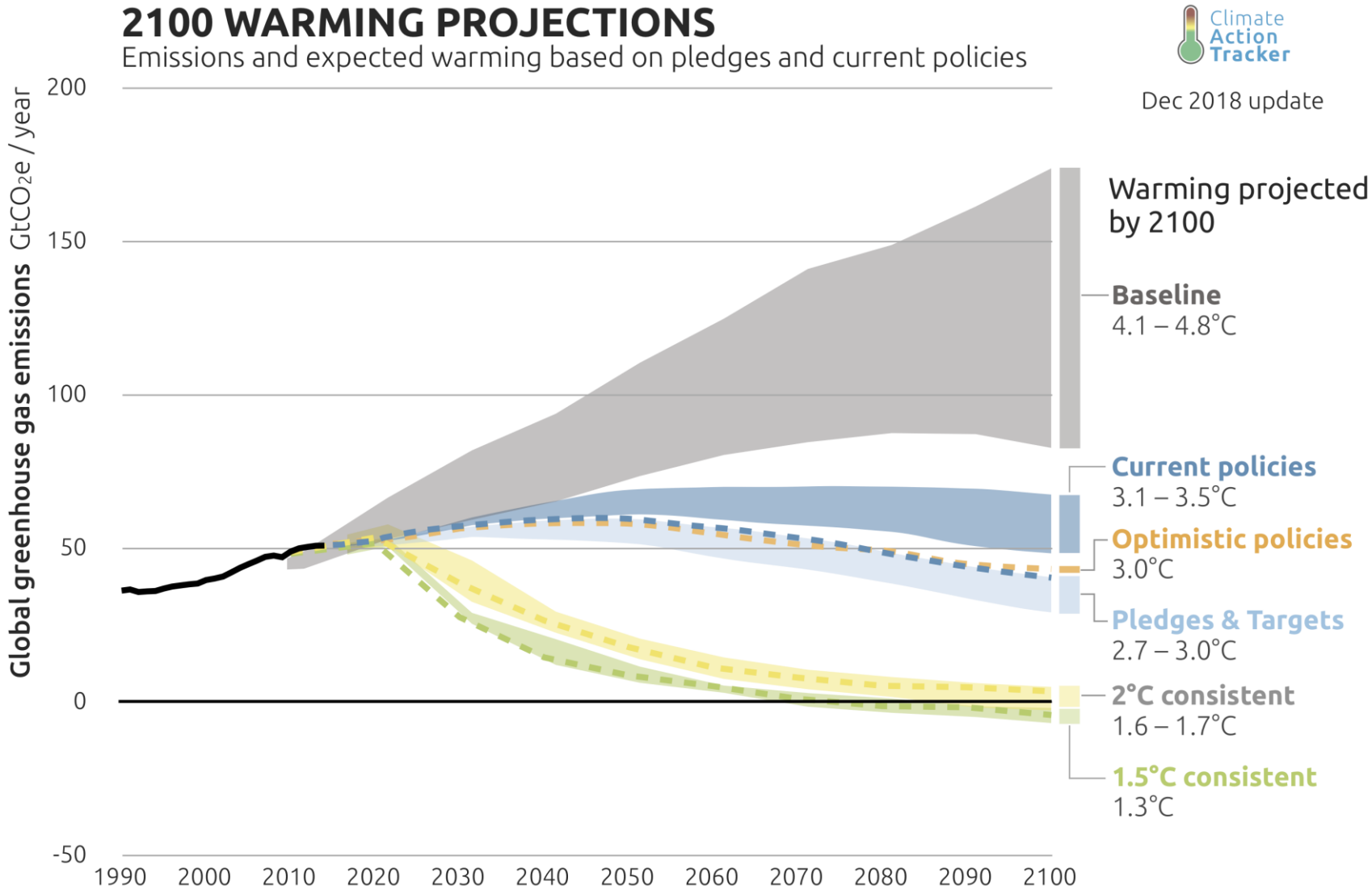
- **Sea level records from Aberdeen show a rise of 8cm between 1900 and 1990.**

- **Sea level will continue to rise beyond the end of this century, even if global mean temperatures remain below 2°C**



What science is the guidance based upon?

- Low emissions, RCP2.6, < 2 °C.
- Medium Emissions RCP4.5 , 1.7-3.2 °C by 2081-2100.
- **High Emissions RCP8.5, 3.2-5.4 °C by 2081-2100.**



Fluvial floodin

10th Percentile

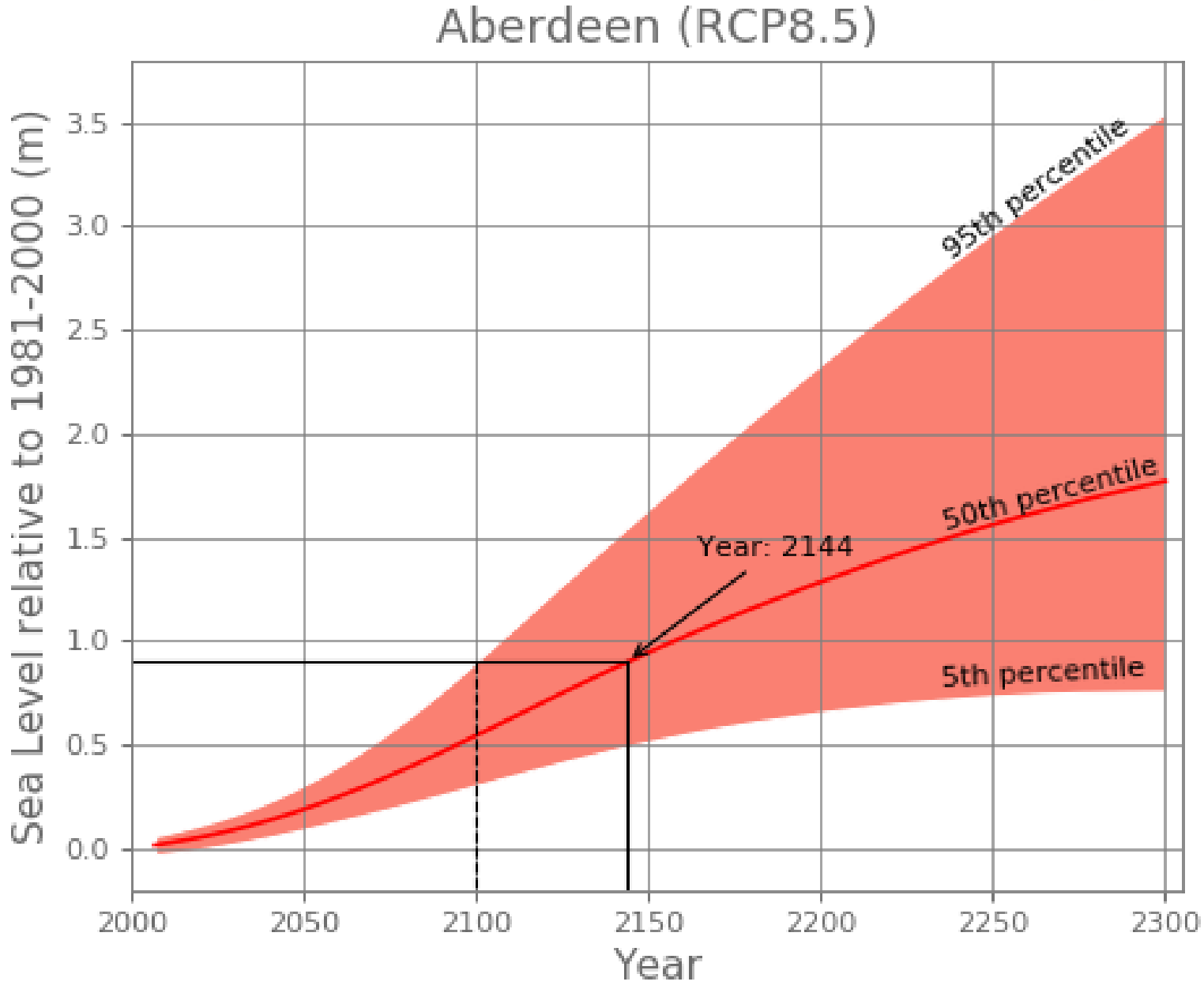
River Basin Region Total change to the year 2100	River Basin Region Total change to the year 2100
Argyll	56%
Clyde	44%
Forth	40%
North East	24%
North Highland	37%
Orkney	41%
Shetland	41%
Solway	44%
Tay	35%
Tweed	33%
Western Isles	56%
West Highlands	56%

Percentage change i

From CEH 2011 study - h
https://www.sepa.org.uk/media/219493/cen_report_final_sepa.pdf

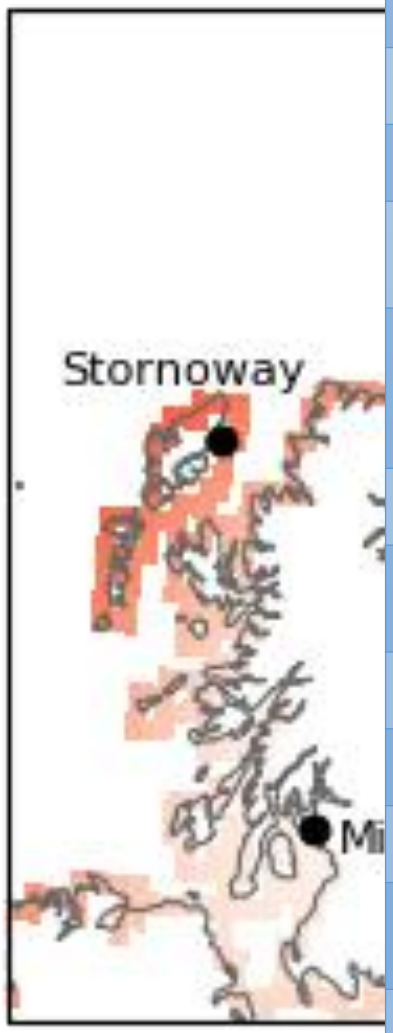
Coastal flooding

- Changes in mean sea level only
- RCP 8.5, 95th%ile for 2017 to 2100
- Cumulative increase from 2017-2100 (CFB base year 2017)
- Under all emissions scenario sea level rise continues after 2100.



Coastal floodin

2100 (RCP8.5, Uppe



River Basin Region	Cumulative rise (in metres) from 2017 to 2100
Argyll	0.86
Clyde	0.85
Forth	0.86
North East	0.87
North Highland	0.89
Orkney	0.93
Shetland	1.02
Solway	0.88
Tay	0.85
Tweed	0.89
Western Isles	0.93
West Highland	0.89

vel rise varies
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region.
vel rise affects
shore wave
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overtopping
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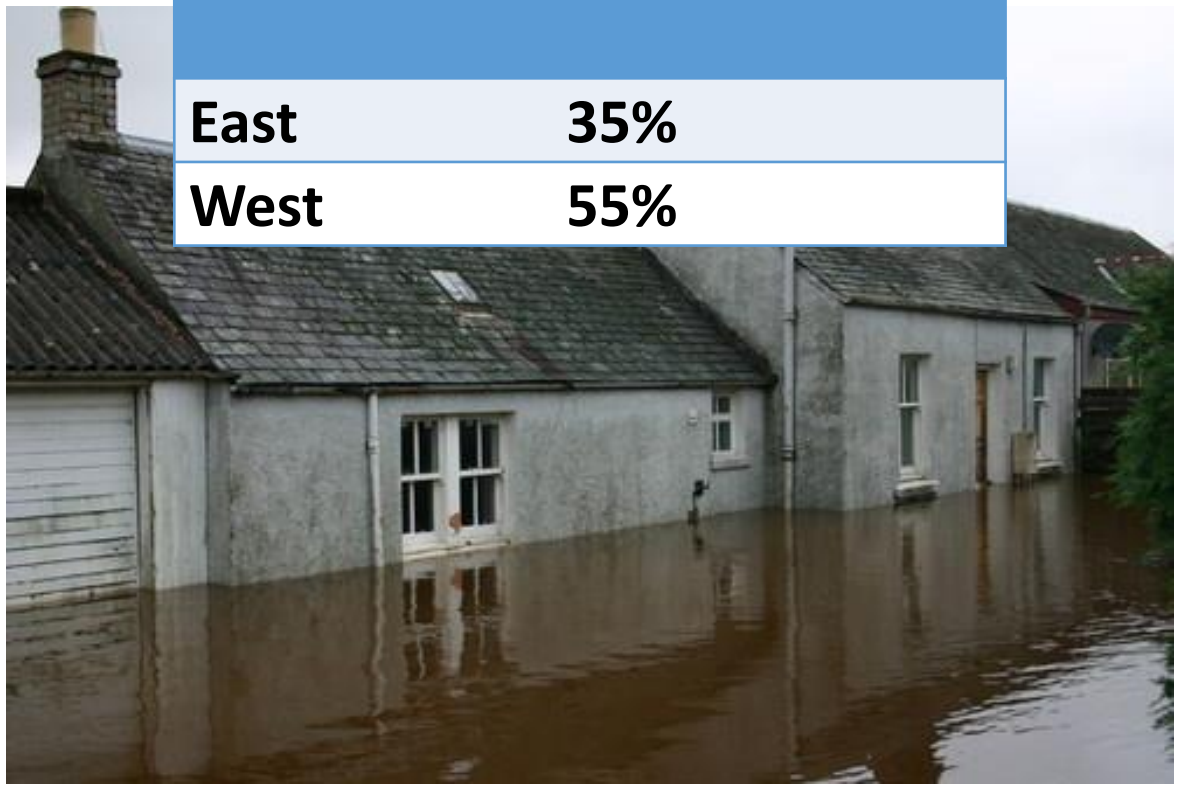
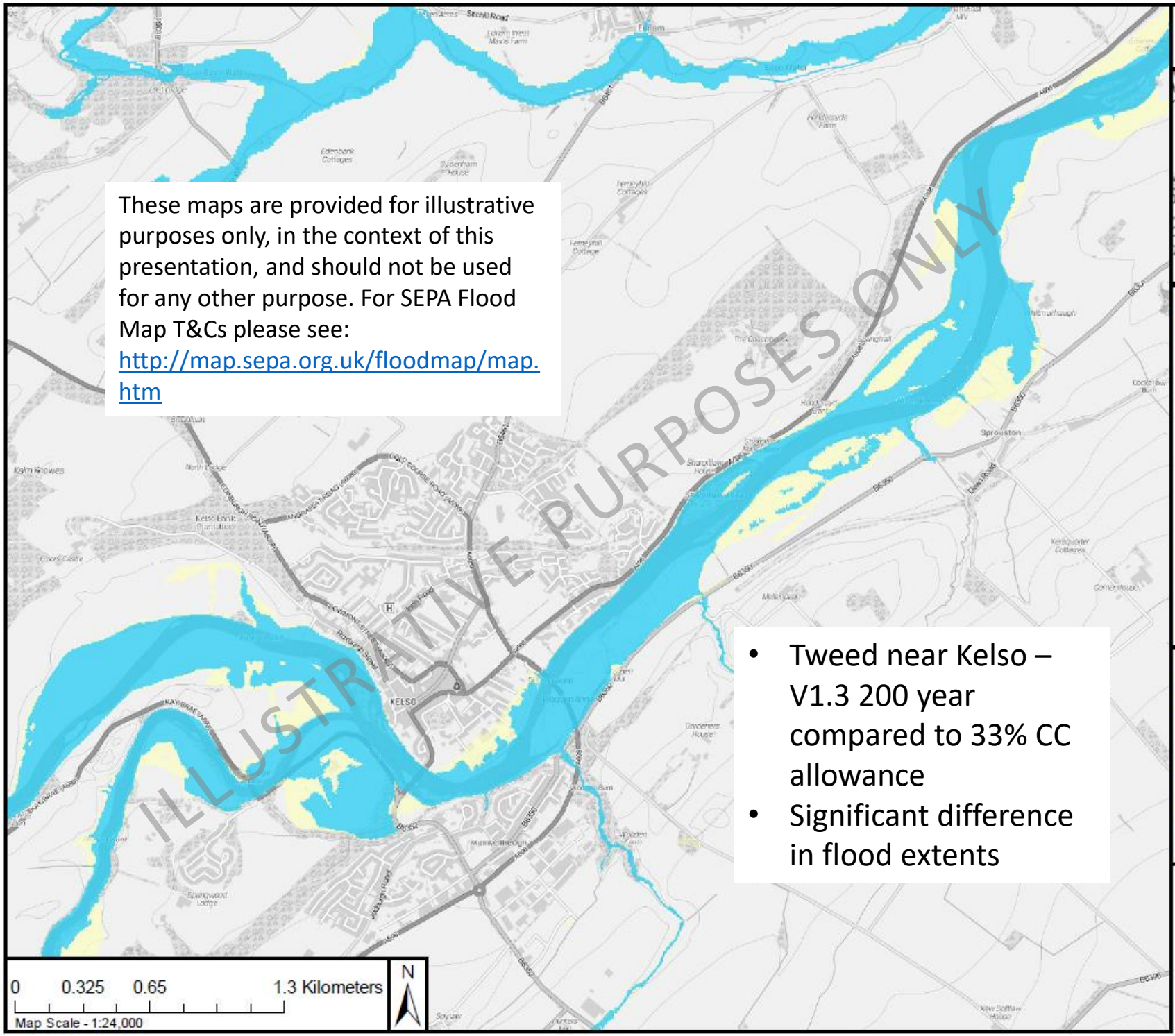
Surface water flooding

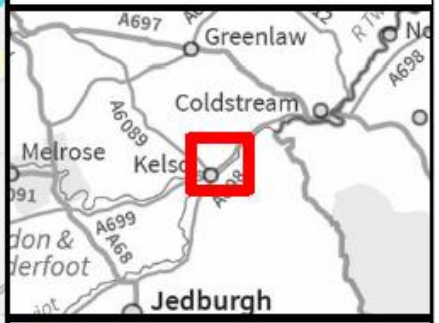
- Increased temperatures - more intense storms are expected, extreme downpours will be heavier.
- Allowances based on UKWIR Report “Rainfall Intensity for Sewer Design” - RCP8.5, central estimate, 2080s
- UKCP18 high resolution (2.2km) projections expected 2019.

Region	Total potential change for 2100
East	35%
West	55%





Example Extents



Map Contents

- River Extent (v1.3) - Medium Likelihood (200yr)
- River Extent 200yr & Climate Change

Climate change scenario uplift applied to flows based on CEH study (2011) which was based on UKCP09 2080s high emissions scenario 67th percentile.

Map created 03/06/2019

- Tweed near Kelso – V1.3 200 year compared to 33% CC allowance
- Significant difference in flood extents

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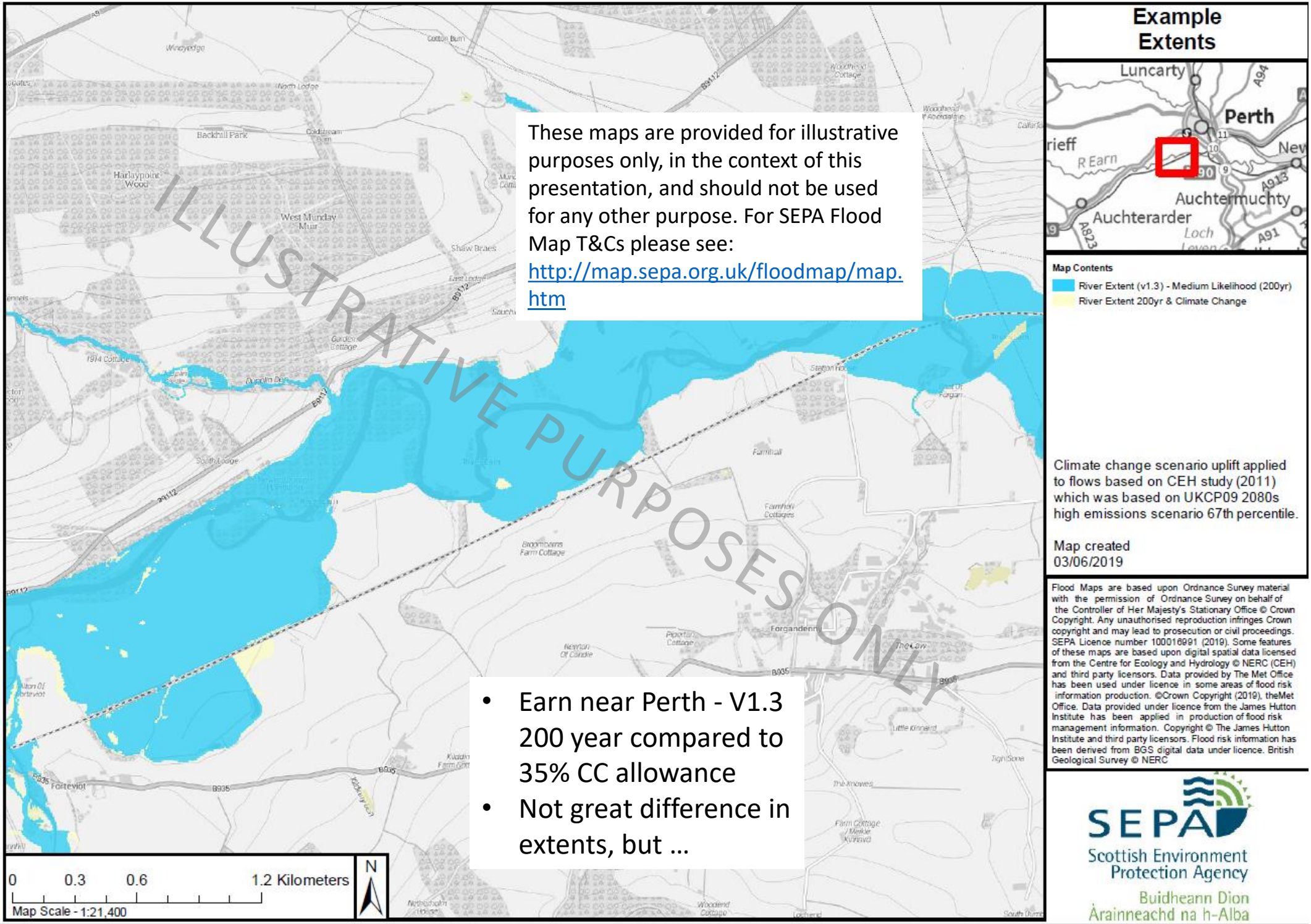
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ILLUSTRATIVE PURPOSES ONLY
Example Extents
Luncarty
Perth
Auchtermuchty
Auchterarder
Loch Leven
R Earn
Map Contents
River Extent (v1.3) - Medium Likelihood (200yr)
River Extent 200yr & Climate Change
Climate change scenario uplift applied to flows based on CEH study (2011) which was based on UKCP09 2080s high emissions scenario 67th percentile.
Map created 03/06/2019
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• Earn near Perth - V1.3 200 year compared to 35% CC allowance
• Not great difference in extents, but …
0 0.3 0.6 1.2 Kilometers
Map Scale - 1:21,400
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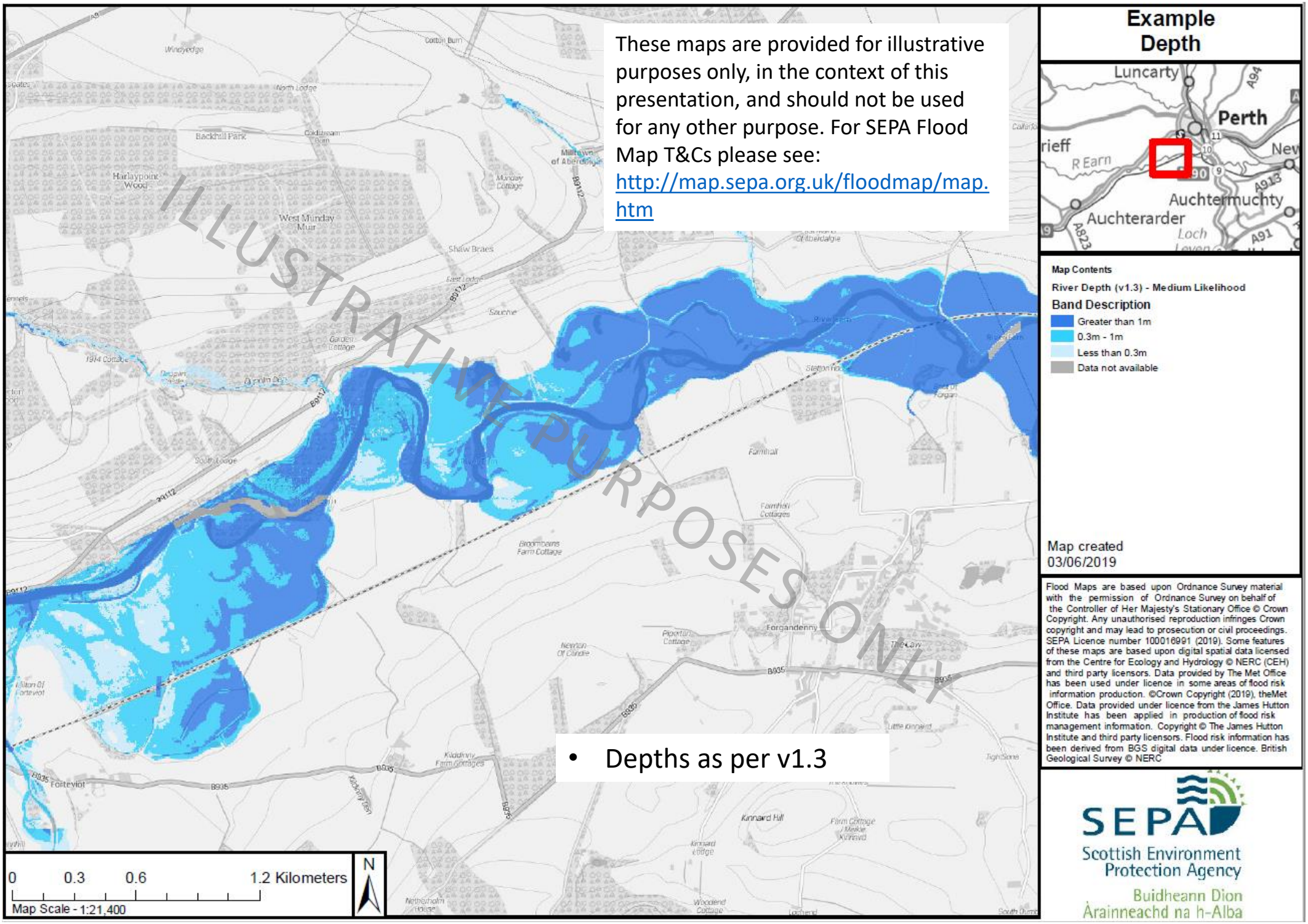
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Example Depth
Luncarty
Perth
Auchtermuchty
Auchterarder
Map Contents
River Depth (v1.3) - Medium Likelihood
Band Description
Greater than 1m
0.3m - 1m
Less than 0.3m
Data not available
Map created 03/06/2019
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• Depths as per v1.3
0 0.3 0.6 1.2 Kilometers
Map Scale - 1:21,400
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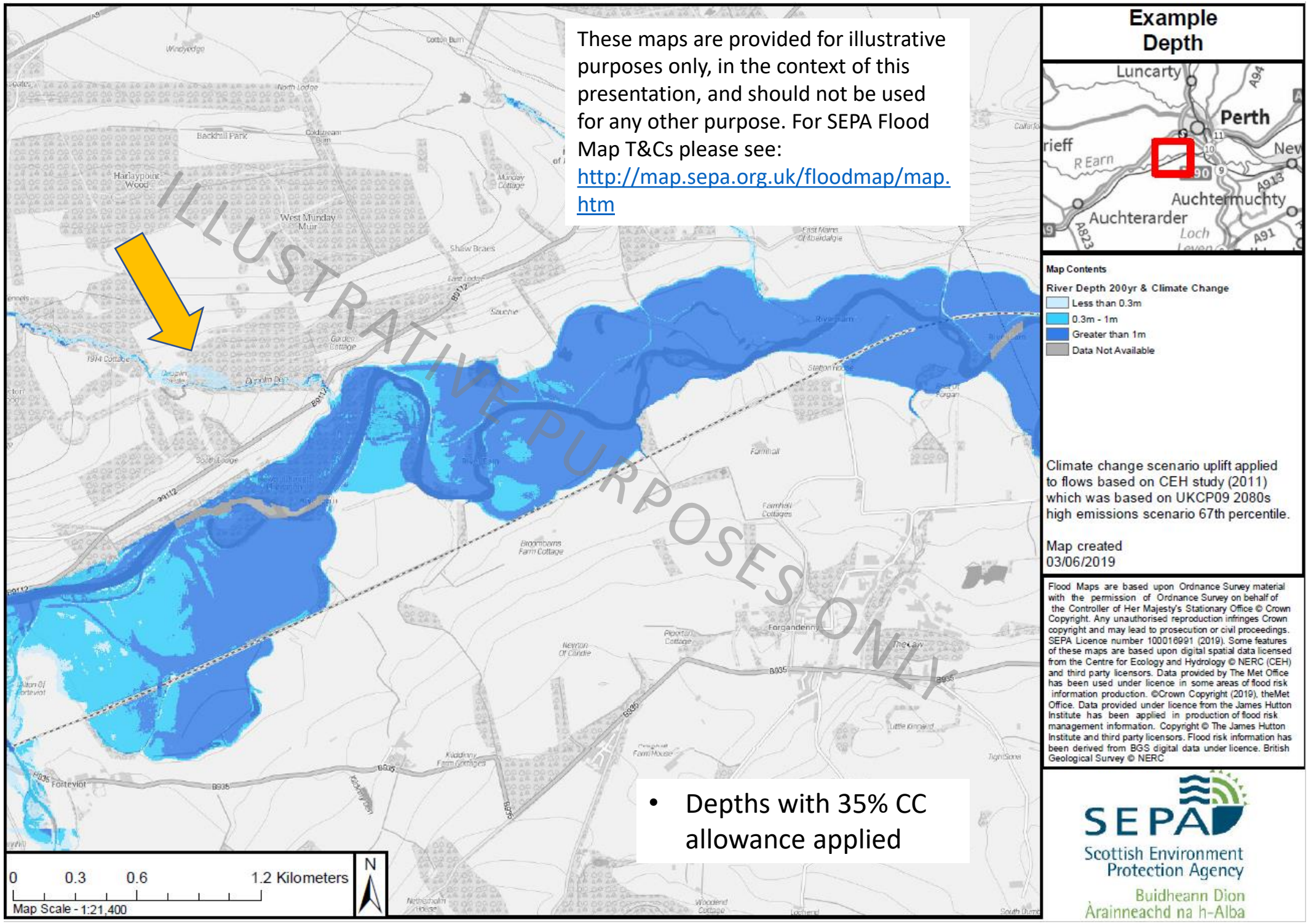
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Map Contents
River Depth 200yr & Climate Change
Less than 0.3m
0.3m - 1m
Greater than 1m
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• Depths with 35% CC allowance applied
0 0.3 0.6 1.2 Kilometers
Map Scale - 1:21,400
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Implications for climate-resilient places

Places we build now need to be places where people can & want to live in 2100.

Spend now save in the future

Link to the guidance:

https://www.sepa.org.uk/media/426913/lups_cc1.pdf

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