Public Document Pack

Your contact: Martin Ibrahim
Ext: 2173
Date: 8 September 2016

Leader and Members
of the District Planning Executive Panel

cc. All other recipients of the District Planning Executive Panel agenda

Dear Councillor

DISTRICT PLANNING EXECUTIVE PANEL - 15 SEPTEMBER 2016: STRATEGIC FLOOD RISK ASSESSMENT, AUGUST 2015 APPENDICES

Please find attached the appendices to the above report which have been printed separately to the main agenda:

11. Strategic Flood Risk Assessment, August 2016 (Pages 3 - 274)

Please bring these papers with you to the meeting next Thursday.

Yours faithfully

Martin Ibrahim
Democratic Services Team Leader
Democratic Services
martin.ibrahim@eastherts.gov.uk

MEETING	**:**	DISTRICT PLANNING EXECUTIVE PANEL
VENUE	**:**	COUNCIL CHAMBER, WALLFIELDS, HERTFORD
DATE	**:**	THURSDAY 15 SEPTEMBER 2016
TIME	**:**	7.00 PM

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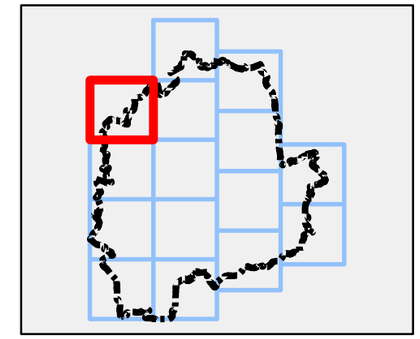

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Ardeley Brook
- River Beane

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
B	Aug 16	Final v1.0
C		

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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX A
EHDC WATERCOURSES

Sheet No: 1 of 15 Index Number: EHDC_SFRA_01

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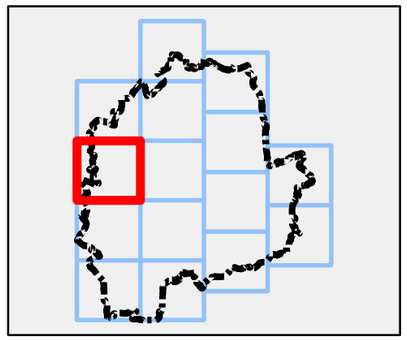

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Aston End Brook
- Dane End Tributary
- River Beane
- Stevenage Brook
- The Old Bourne

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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Sheet No: 2 of 15 Index Number: EHDC_SFRA_02

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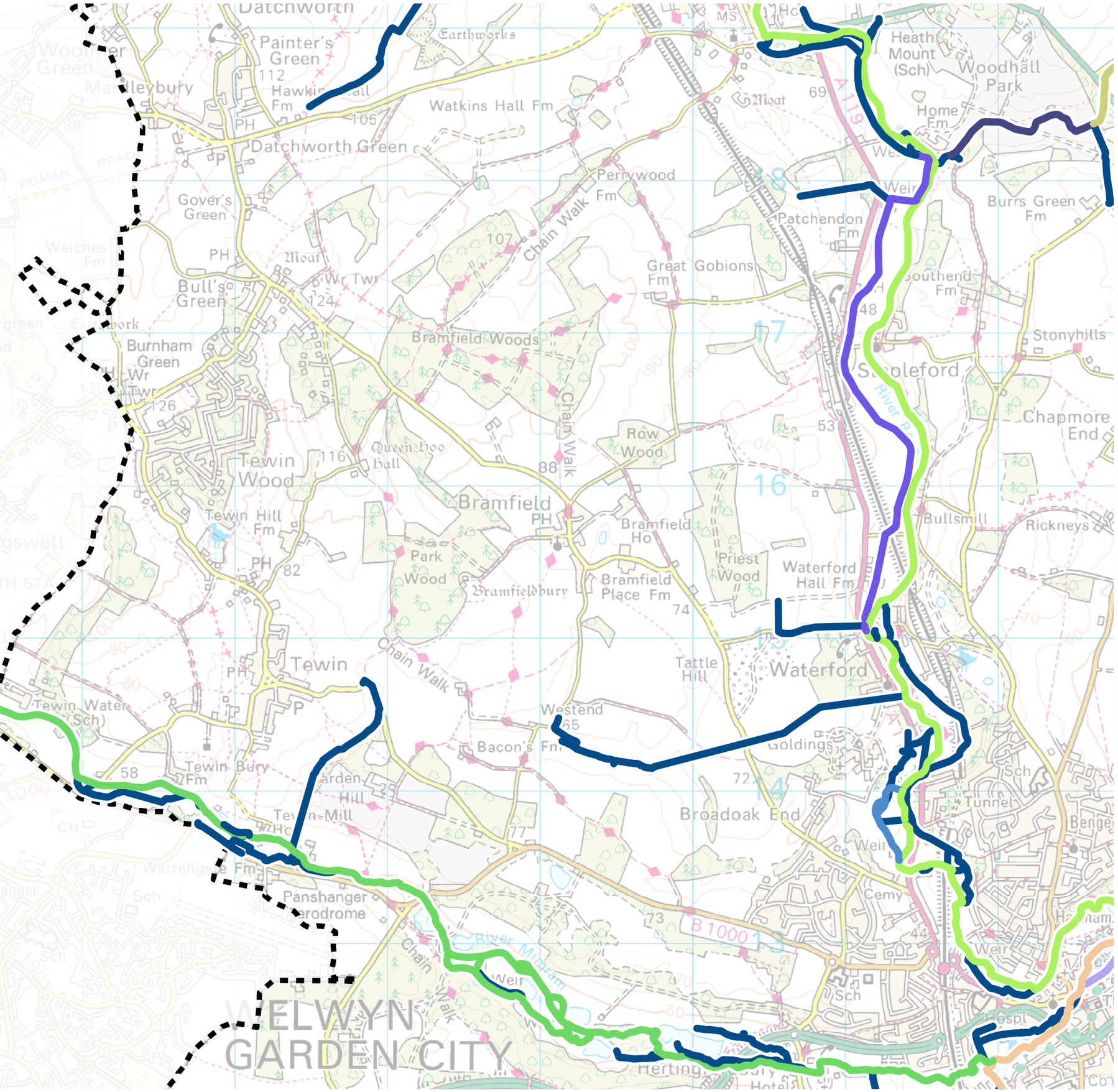
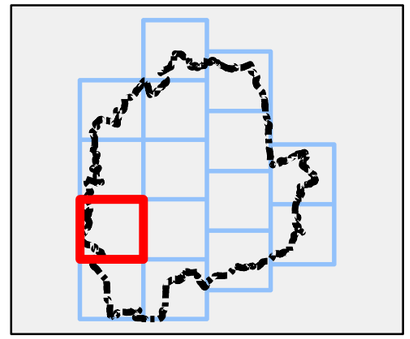


Page 7



Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Dane End Tributary
- Goldings Canal
- River Beane
- River Lea or Lee
- River Lee Navigation
- River Mimram
- Stapleford Marsh Ditch
- The Cuts

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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Sheet No: 3 of 15 Index Number: EHDC_SFRA_03

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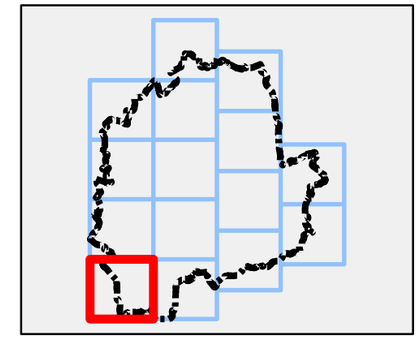

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Bayford Brook
- Brickendon Brook
- River Lea or Lee
- River Mimram
- Spital Brook
- Wormleybury Brook

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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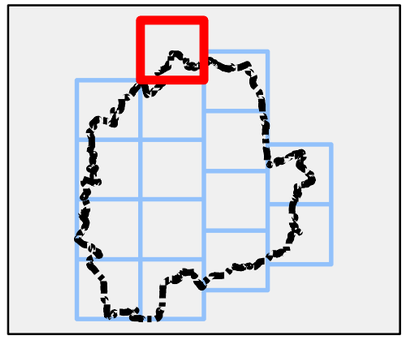

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- River Quin
- River Rib

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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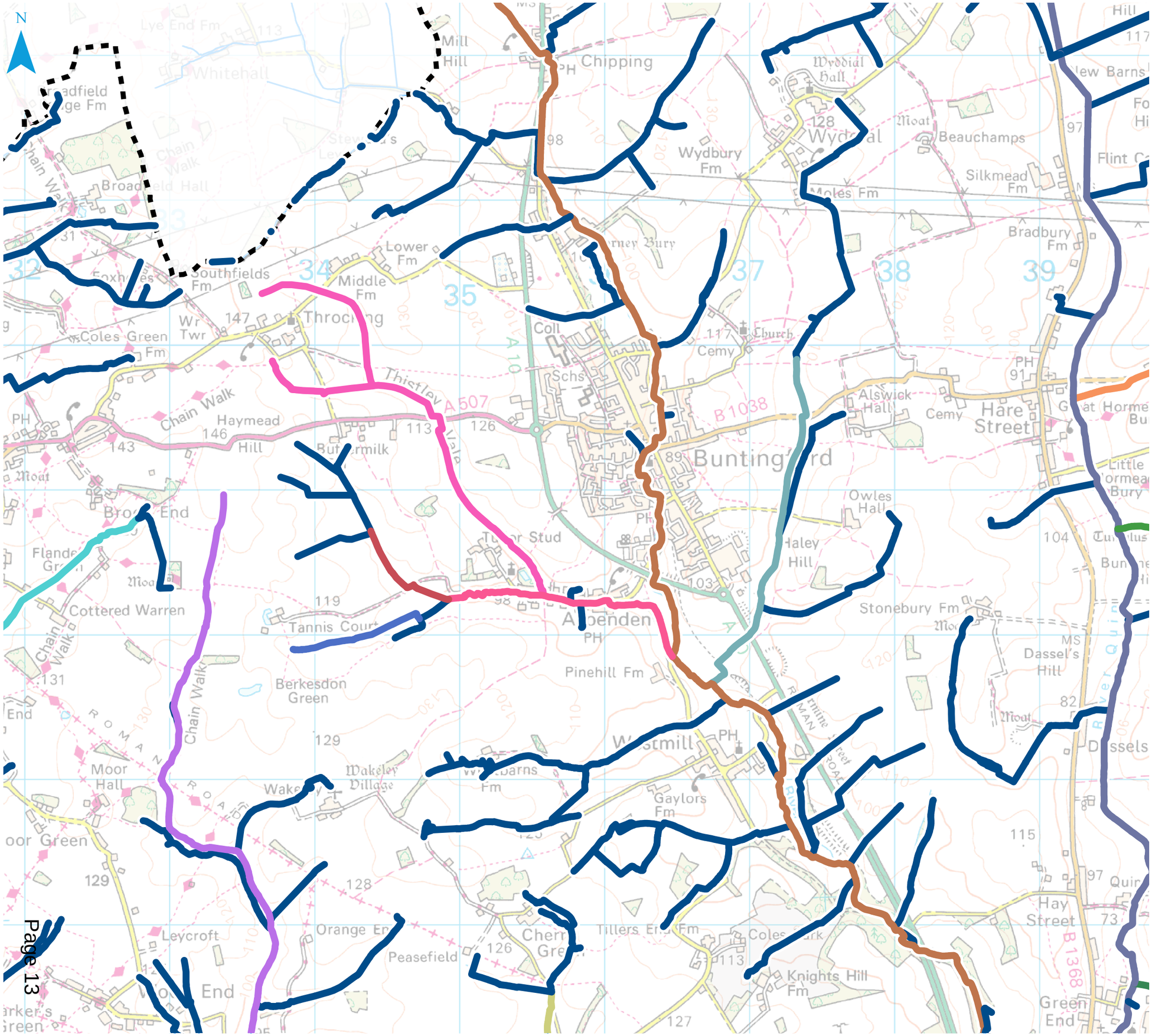

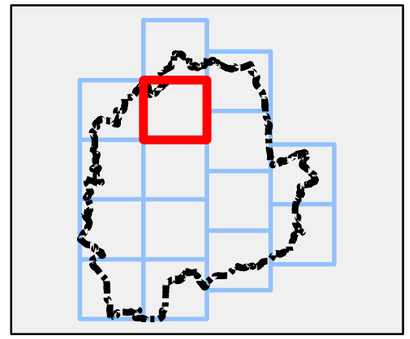

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Ardeley Brook
- Aspenden Brook
- Braughing Bourne
- Dane End Tributary
- Great Hormead Brook
- Haley Hill Ditch
- Little Hormead Brook
- River Quin
- River Rib
- Tannis Court Tributary
- The Bourne
- The Old Bourne
- Thistley Vale Brook

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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Sheet No: 6 of 15 Index Number: EHDC_SFRA_06

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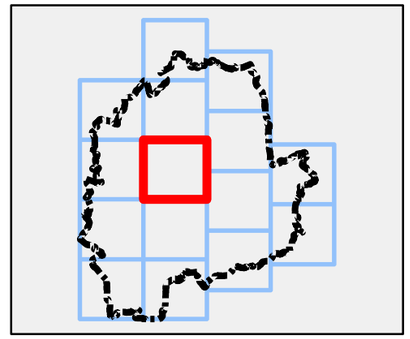

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Barwick Tributary
- Braughing Bourne
- Braughing Warren Bourne
- Chelsings Tributary
- Dane End Tributary
- Puckeridge Tributary
- River Quin
- River Rib
- The Bourne
- The Old Bourne

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
B	Aug 16	Final v1.0
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EHDC WATERCOURSES

Sheet No: 7 of 15 Index Number: EHDC_SFRA_07

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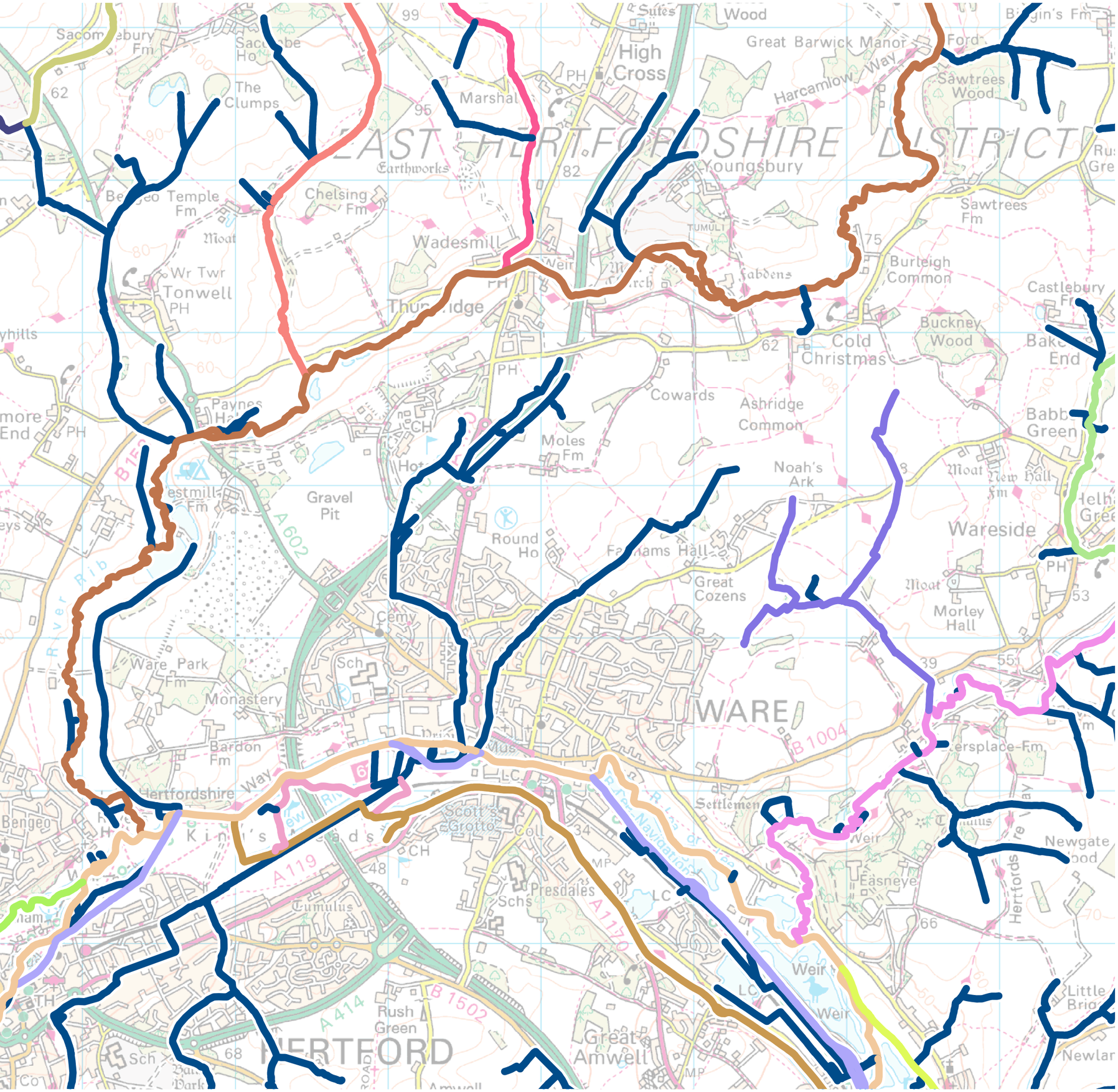

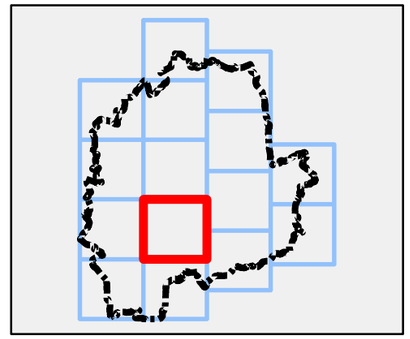

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Chelsings Tributary
- Dane End Tributary
- Fanhams Tributaries
- Manifold Ditch
- New River
- Nimney Bourne
- River Ash
- River Beane
- River Lea or Lee
- River Lee Navigation
- River Mimram
- River Rib
- Stanstead Mill Stream
- The Bourne
- The Cuts

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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Sheet No: 8 of 15 Index Number: EHDC_SFRA_08

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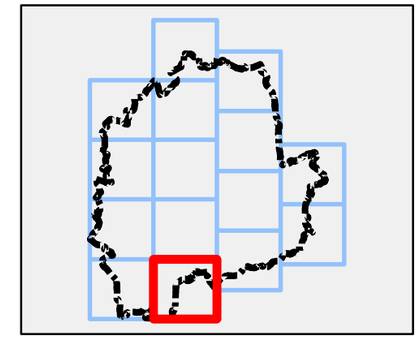

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Bayford Brook
- Brickendon Brook
- Flood Relief Channel
- New River
- River Lea or Lee
- River Lee Navigation
- River Mimram
- River Stort
- River Stort (Navigation)
- Spital Brook
- Stanstead Mill Stream
- Toll House Stream
- Woollens Brook
- Wormleybury Brook

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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EHDC WATERCOURSES

Sheet No: 9 of 15 Index Number: EHDC_SFRA_09

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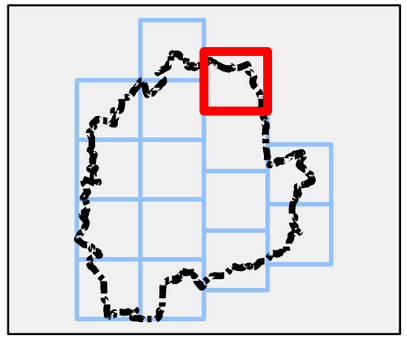

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Black Ditch
- Great Hormead Brook
- Little Hormead Brook
- River Ash
- River Quin
- River Stort

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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Sheet No: 10 of 15 Index Number: EHDC_SFRA_10

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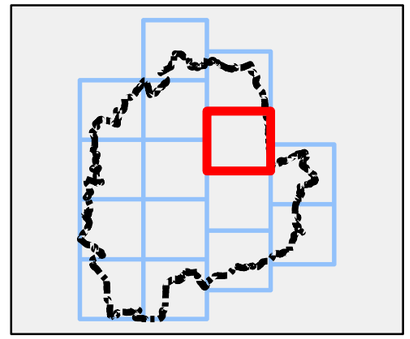

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Braughing Bourne
- Braughing Warren Bourne
- Little Hormead Brook
- Puckeridge Tributary
- River Ash
- River Quin
- River Rib

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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Sheet No: 11 of 15 Index Number: EHDC_SFRA_11

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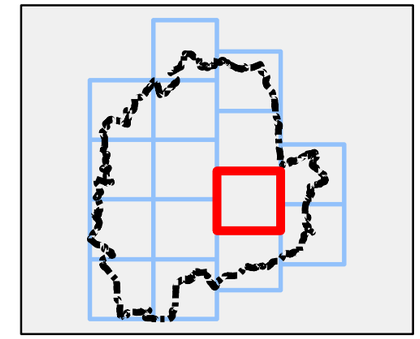

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Fiddlers' Brook
- Nimney Bourne
- River Ash
- River Rib
- The Bourne
- The Canal

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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EHDC WATERCOURSES

Sheet No: 12 of 15 Index Number: EHDC_SFRA_12

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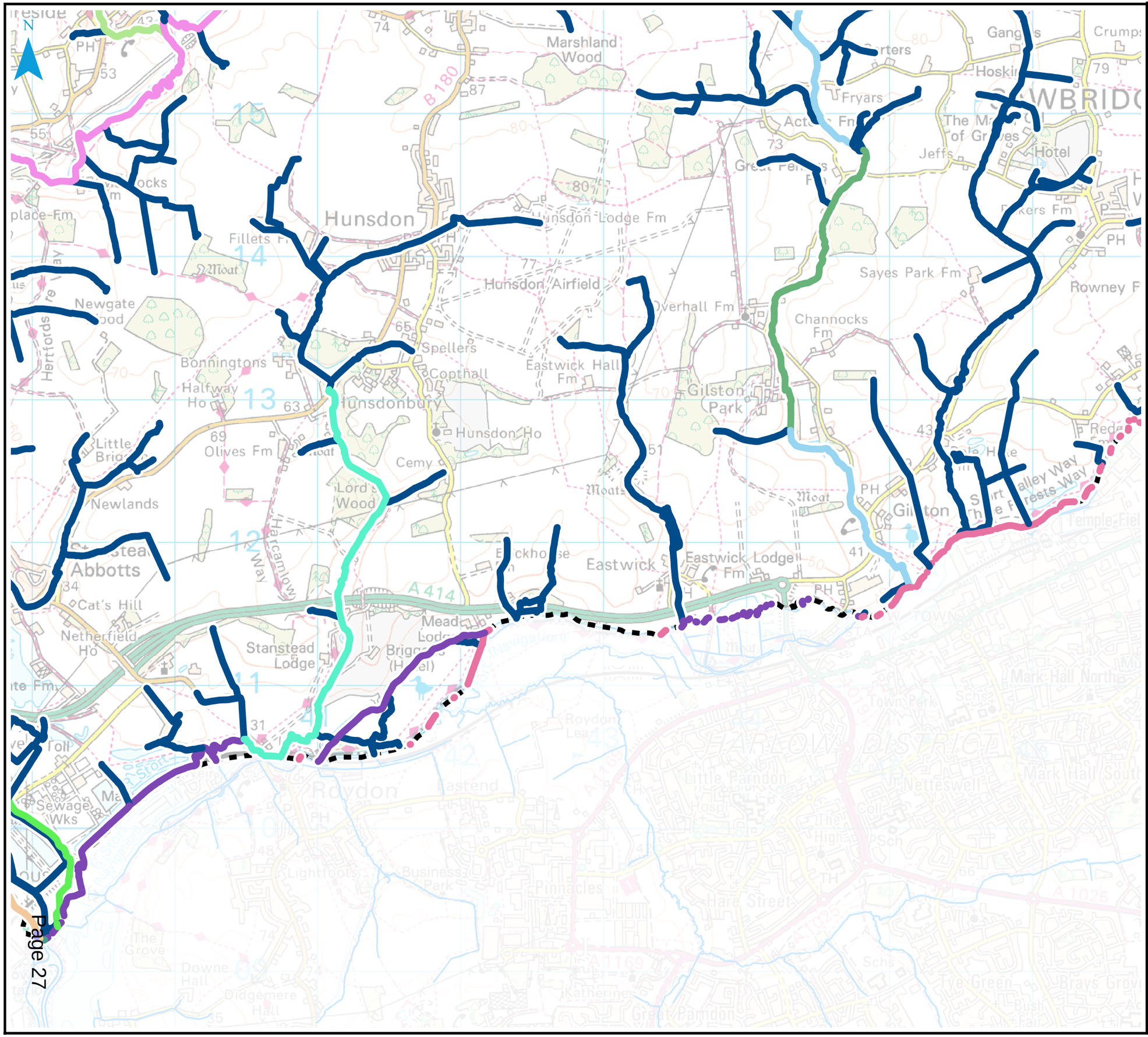

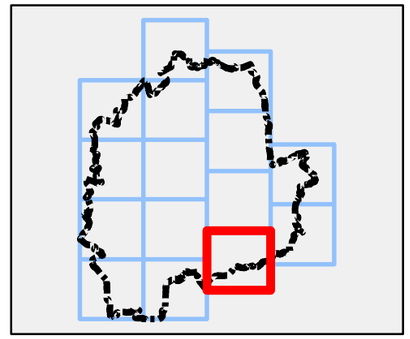

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Canons Brook
- Fiddlers' Brook
- Flood Relief Channel
- Golden Brook
- Hunsdon Brook
- Nimney Bourne
- River Ash
- River Lea or Lee
- River Lee Navigation
- River Stort
- River Stort (Navigation)
- Toll House Stream

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
B	Aug 16	Final v1.0
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Sheet No: 13 of 15 Index Number: EHDC_SFRA_13

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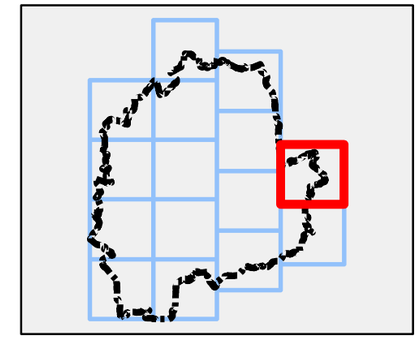

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- Bourne Brook
- River Stort
- River Stort (Navigation)

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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EHDC WATERCOURSES

Sheet No: 14 of 15 Index Number: EHDC_SFRA_14

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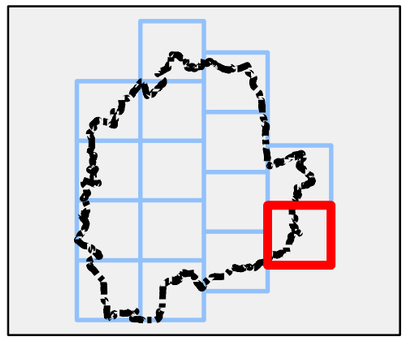

Legend

- East Hertfordshire District Council boundary
- Unnamed Watercourse
- River Stort
- River Stort (Navigation)
- Sheering Mill Lock

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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N

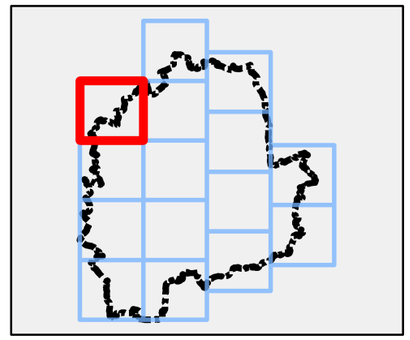
Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Zone 2: Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year.

Zone 3a: This zone comprises land assessed as having a greater than 1in 100 annual probability of river flooding or a greater than 1 in 200 annual probability of flooding from sea in any year.

Zone 3b: This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain).
The SFRA identified this Flood Zone as land which would flood with an annual probability of 1 in 20 years, where detailed modelling exists. In the absence of detailed hydraulic model information, a precautionary approach has been adopted with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3a. If development is shown to be in Flood Zone 3a, further work should be undertaken as part of a detailed site specific flood risk assessment to define the extent of Flood Zone 3b.



Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 1 of 15 Index Number: EHDC_SFRA_01

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STEVENAGE

Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Zone 2: Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year.

Zone 3a: This zone comprises land assessed as having a greater than 1in 100 annual probability of river flooding or a greater than 1 in 200 annual probability of flooding from sea in any year.

Zone 3b: This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain).
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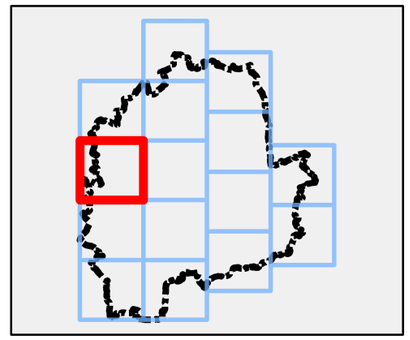

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
C		

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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 2 of 15 Index Number: EHDC_SFRA_02

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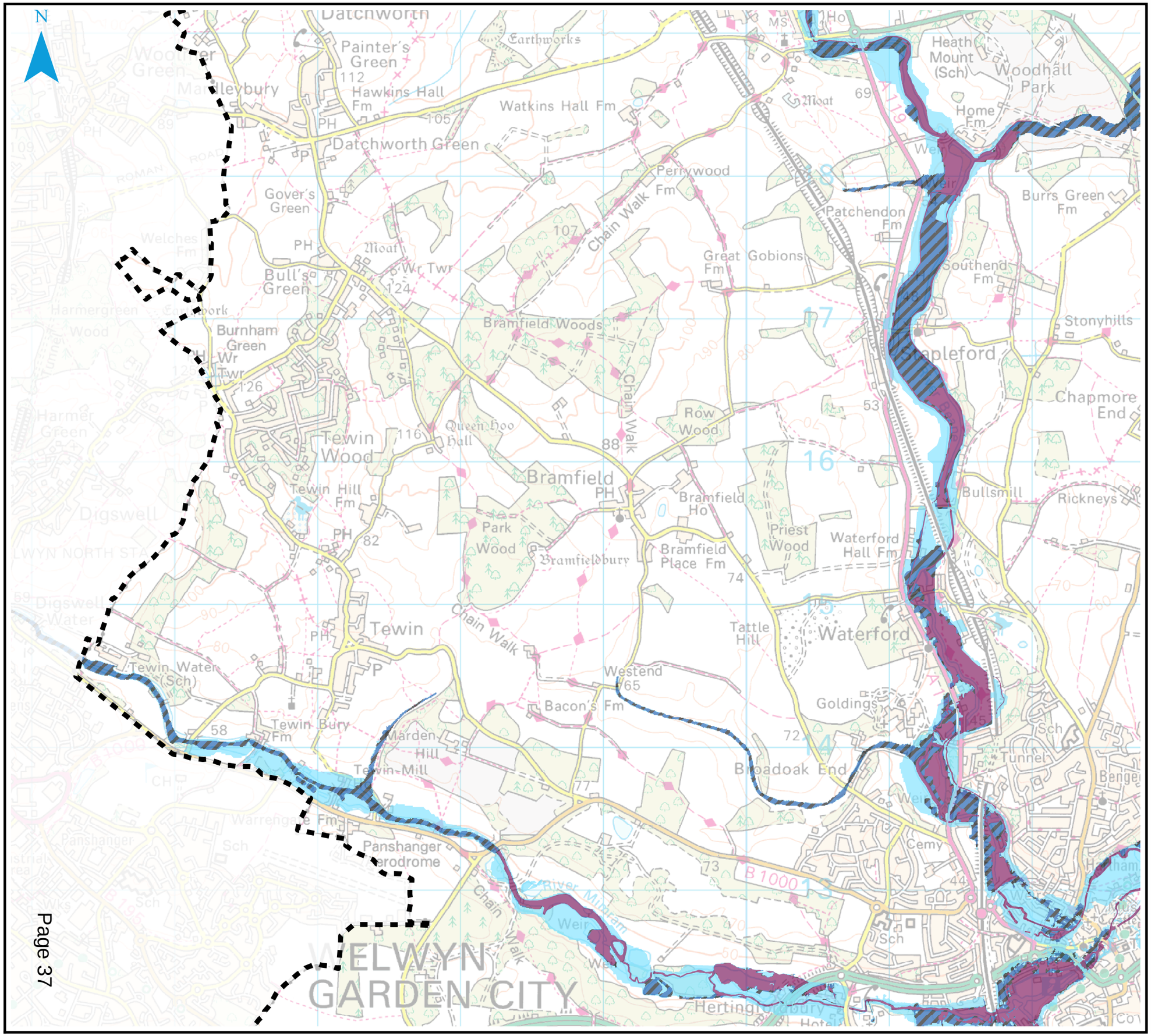

Notes

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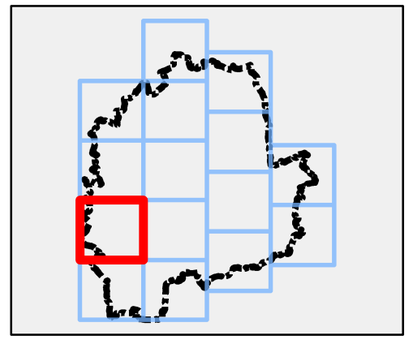

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 3 of 15 Index Number: EHDC_SFRA_03

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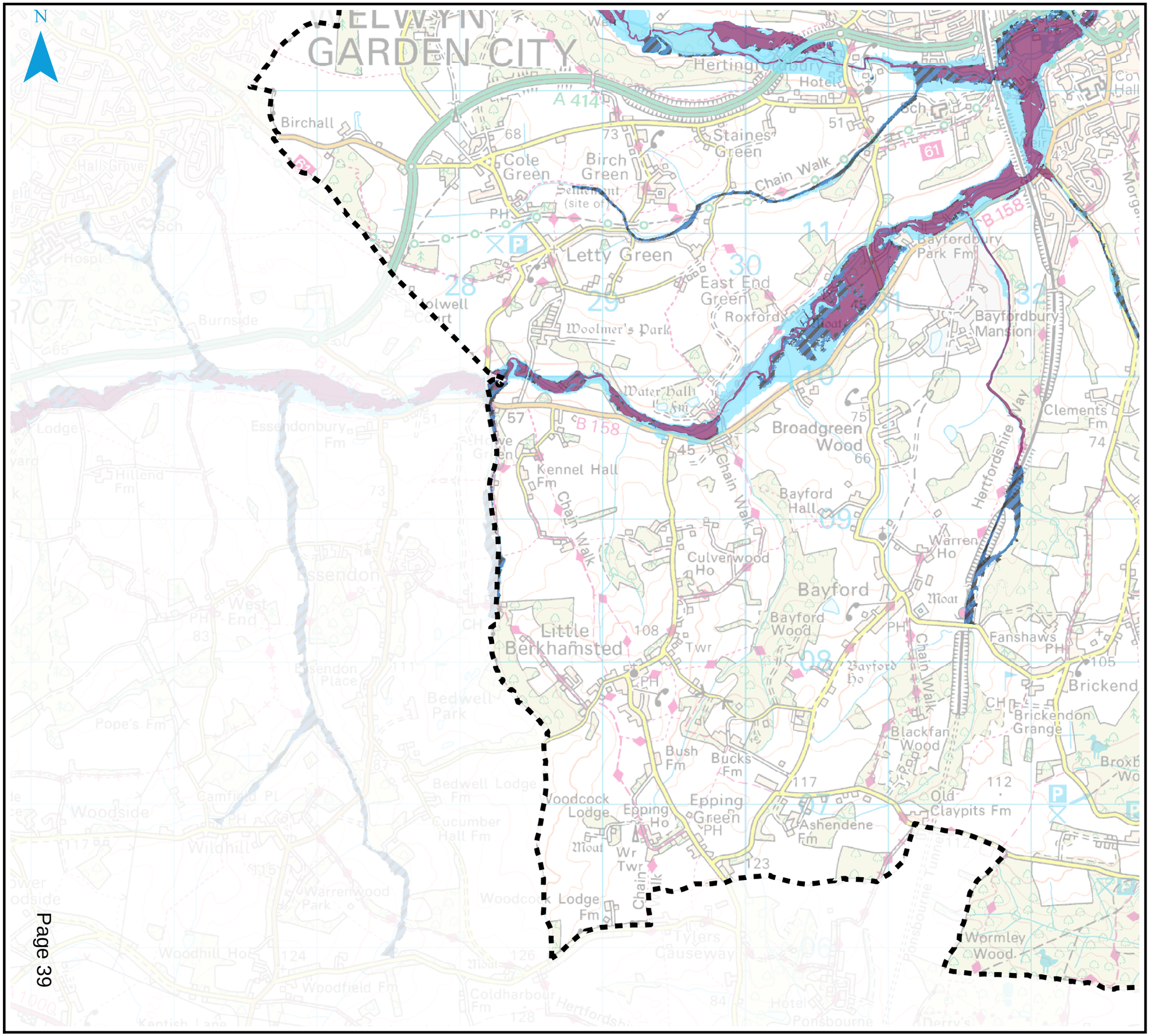

Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Zone 2: Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year.

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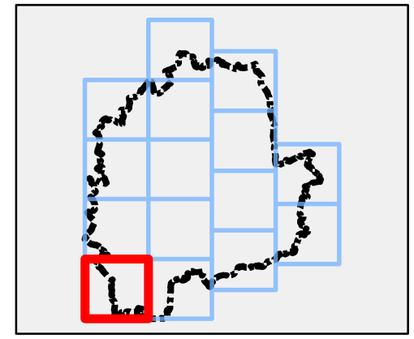

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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FLOOD ZONE MAPS

Sheet No: 1 4 of 15 Index Number: EHDC_SFRA_04

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Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Zone 2: Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year.

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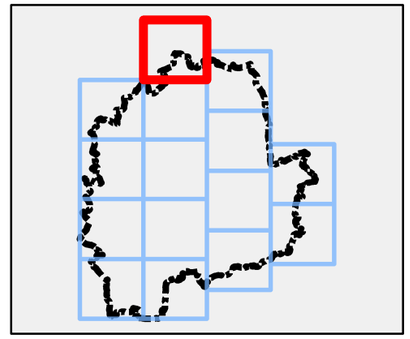

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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Sheet No: 1 5 of 15 Index Number: EHDC_SFRA_05

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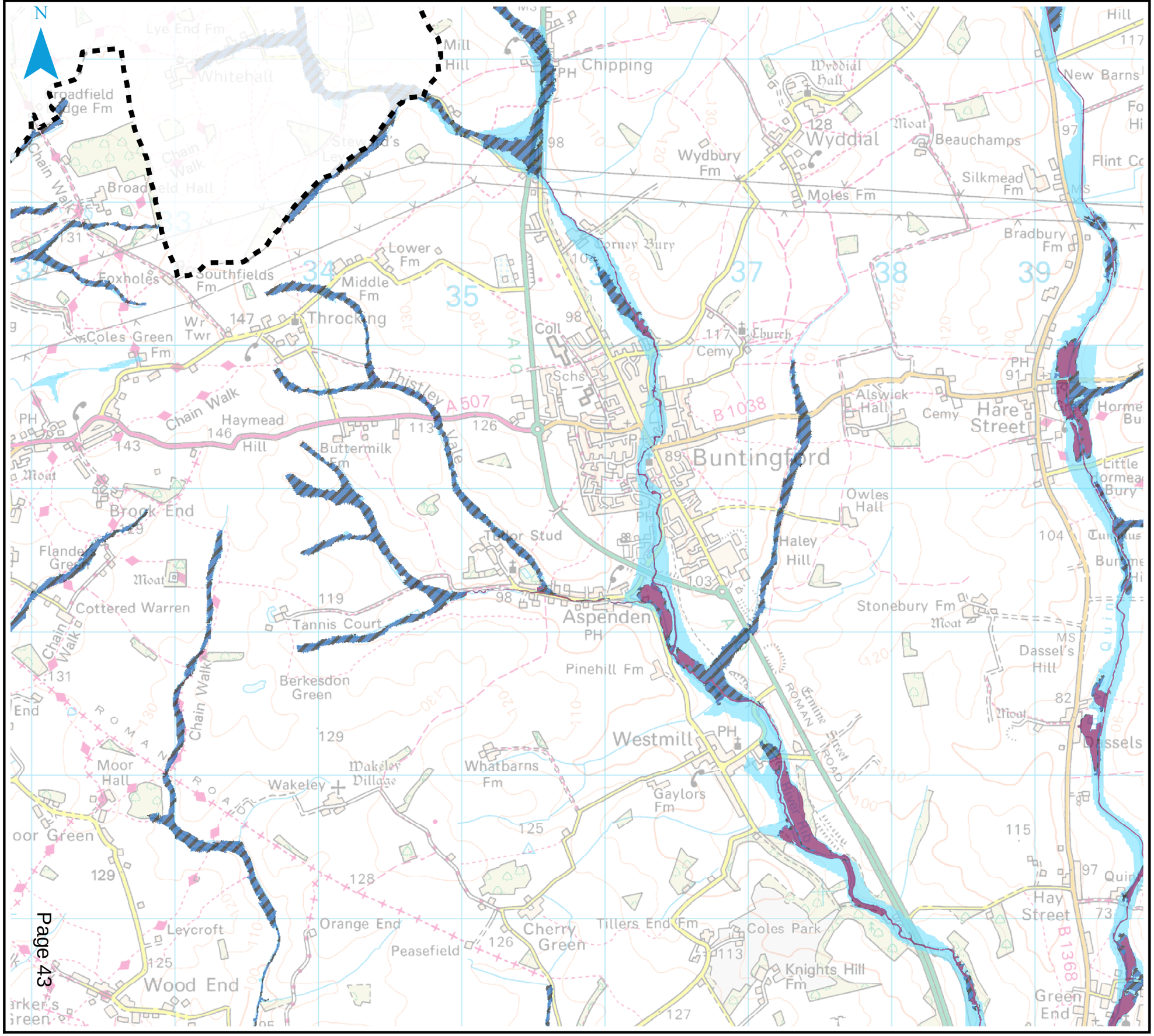

Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Zone 2: Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year.

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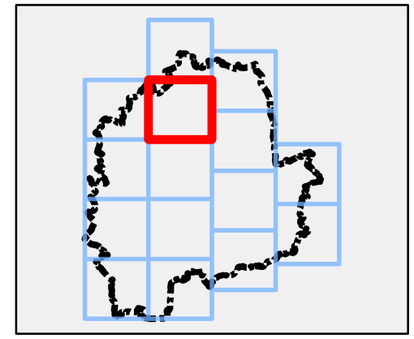

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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FLOOD ZONE MAPS

Sheet No: 1 6 of 15 Index Number: EHDC_SFRA_06

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Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

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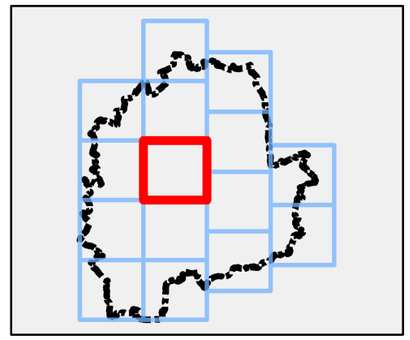

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 7 of 15 Index Number: EHDC_SFRA_07

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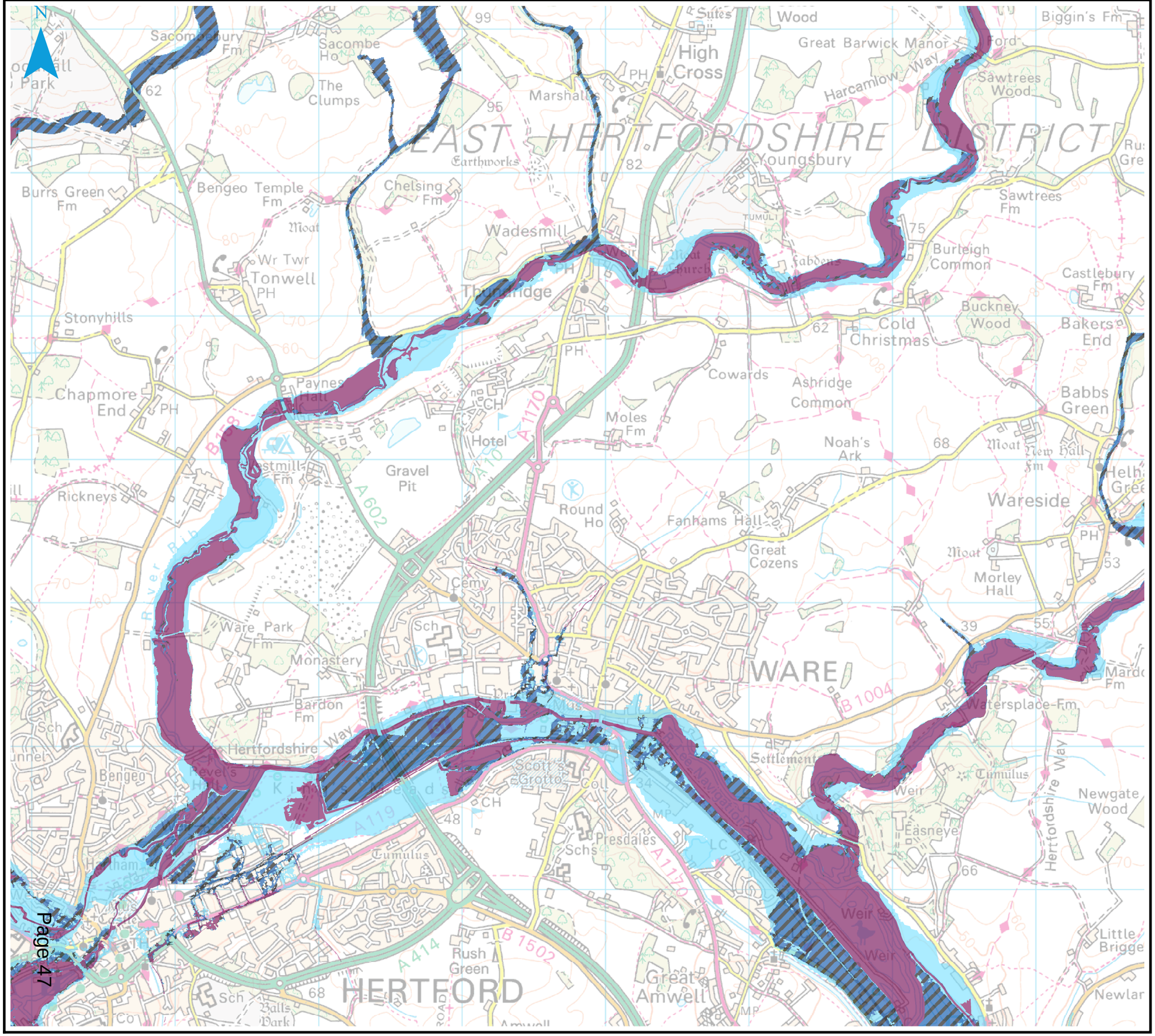

Page 47

Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

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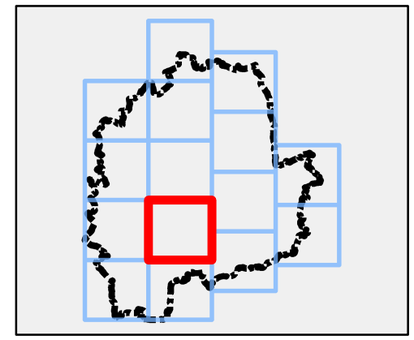

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 8 of 15 Index Number: EHDC_SFRA_08

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East Herts Council

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Notes

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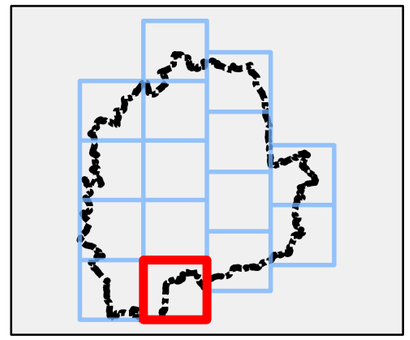

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 9 of 15 Index Number: EHDC_SFRA_09

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Notes

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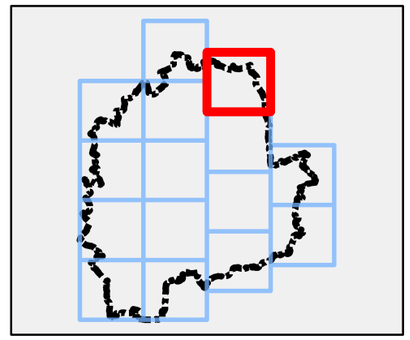

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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APPENDIX B
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Sheet No: 1 10 of 15 Index Number: EHDC_SFRA_10

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Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

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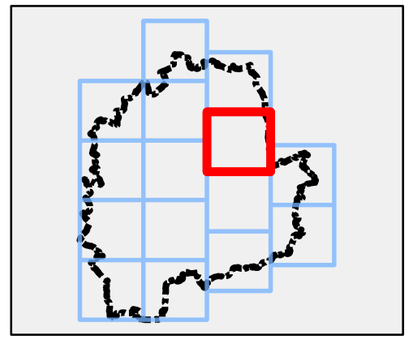

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA
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Sheet No: 1 11 of 15 Index Number: EHDC_SFRA_11

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Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

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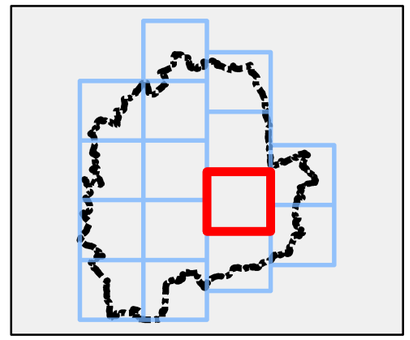

Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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B	Aug 16	Final v.1.0
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Sheet No: 1 12 of 15 Index Number: EHDC_SFRA_12

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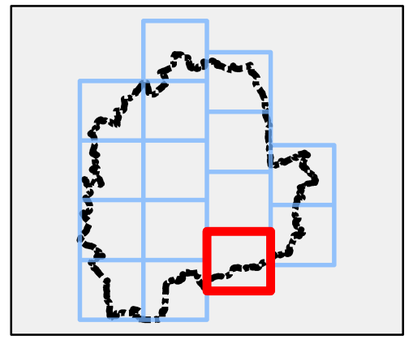
Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Zone 2: Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year.

Zone 3a: This zone comprises land assessed as having a greater than 1in 100 annual probability of river flooding or a greater than 1 in 200 annual probability of flooding from sea in any year.

Zone 3b: This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain).
The SFRA identified this Flood Zone as land which would flood with an annual probability of 1 in 20 years, where detailed modelling exists. In the absence of detailed hydraulic model information, a precautionary approach has been adopted with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3a. If development is shown to be in Flood Zone 3a, further work should be undertaken as part of a detailed site specific flood risk assessment to define the extent of Flood Zone 3b.



Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
C		

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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 13 of 15 Index Number: EHDC_SFRA_13

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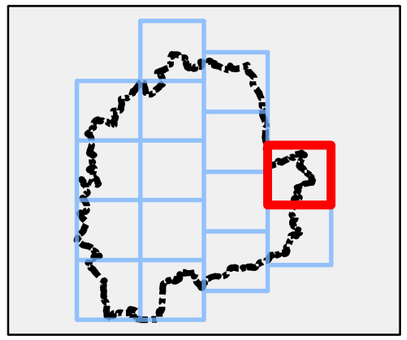
Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Zone 2: Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year.

Zone 3a: This zone comprises land assessed as having a greater than 1in 100 annual probability of river flooding or a greater than 1 in 200 annual probability of flooding from sea in any year.

Zone 3b: This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain).
The SFRA identified this Flood Zone as land which would flood with an annual probability of 1 in 20 years, where detailed modelling exists. In the absence of detailed hydraulic model information, a precautionary approach has been adopted with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3a. If development is shown to be in Flood Zone 3a, further work should be undertaken as part of a detailed site specific flood risk assessment to define the extent of Flood Zone 3b.



Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
C		

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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 14 of 15 Index Number: EHDC_SFRA_14

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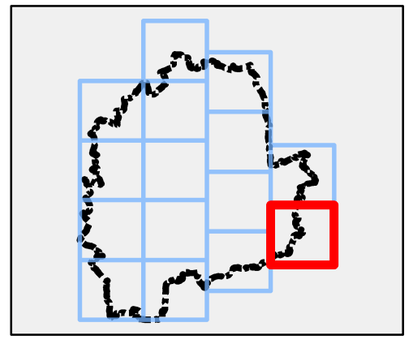
Notes

Zone 1: Comprised of land having a less than 1 in 1,000 annual probability of river or sea flooding in any year.

Zone 2: Comprised of land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or 1 in 200 and 1 in 1,000 annual probability of sea flooding in any year.

Zone 3a: This zone comprises land assessed as having a greater than 1in 100 annual probability of river flooding or a greater than 1 in 200 annual probability of flooding from sea in any year.

Zone 3b: This zone comprises land where water has to flow or be stored in times of flood (the functional floodplain).
The SFRA identified this Flood Zone as land which would flood with an annual probability of 1 in 20 years, where detailed modelling exists. In the absence of detailed hydraulic model information, a precautionary approach has been adopted with the assumption that the extent of Flood Zone 3b would be equal to Flood Zone 3a. If development is shown to be in Flood Zone 3a, further work should be undertaken as part of a detailed site specific flood risk assessment to define the extent of Flood Zone 3b.



Legend

- East Hertfordshire District Council boundary
- Flood Zone 3b
- Indicative Extent of Flood Zone 3b
- Flood Zone 3a
- Flood Zone 2

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX B
FLOOD ZONE MAPS

Sheet No: 1 15 of 15 Index Number: EHDC_SFRA_15

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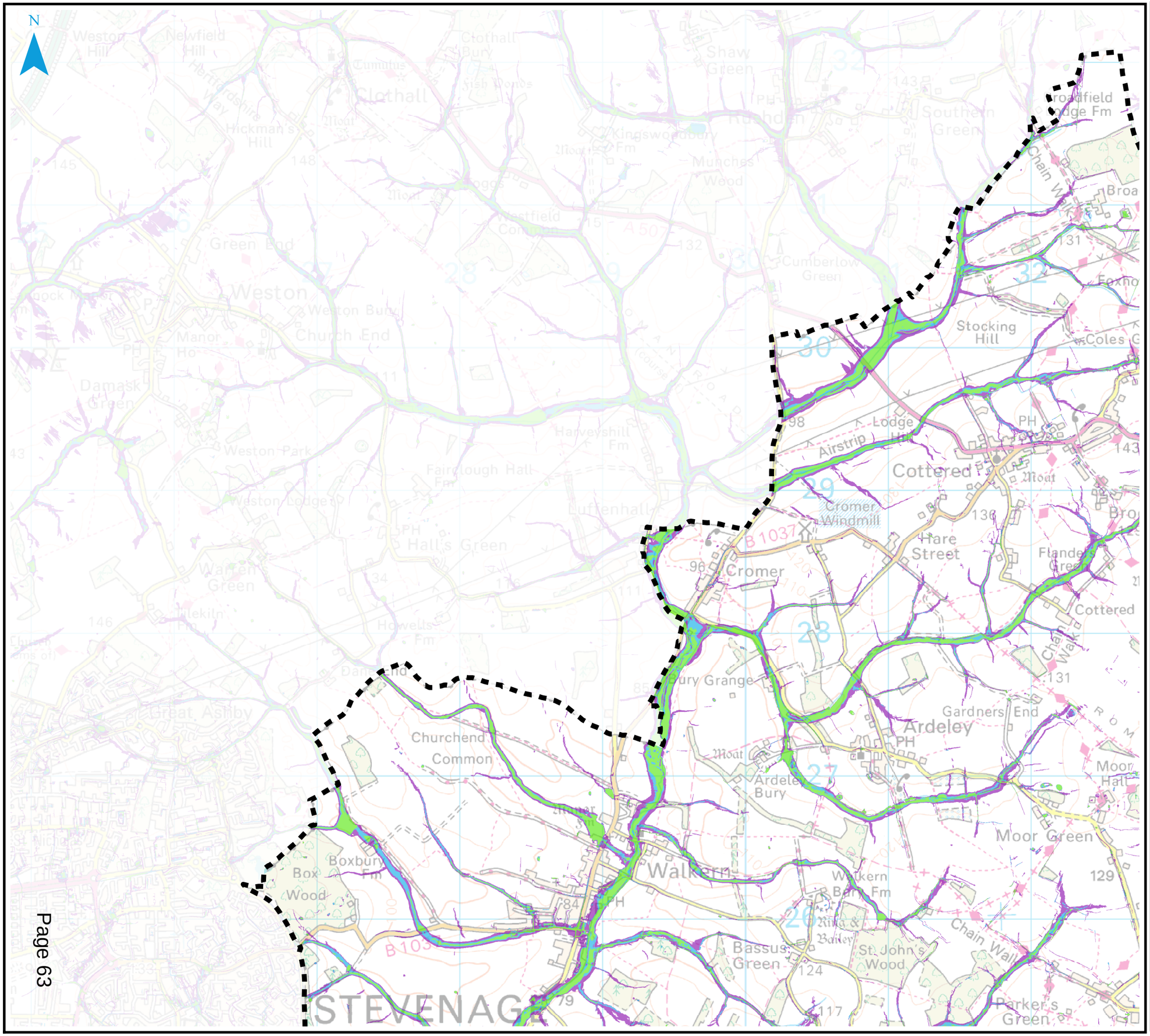
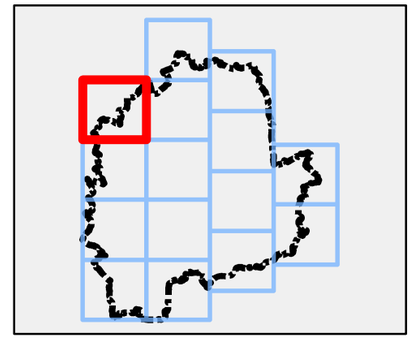


Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
(a) is on the surface of the ground (whether or not it is moving), and
(b) has not yet entered a watercourse, drainage system or public sewer.

The uFMfSW will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.

The uFMfSW shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The uFMfSW should not be used to predict if individual properties will flood.



Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
C		

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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA
APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 1 of 15 Index Number: EHDC_SFRA_01

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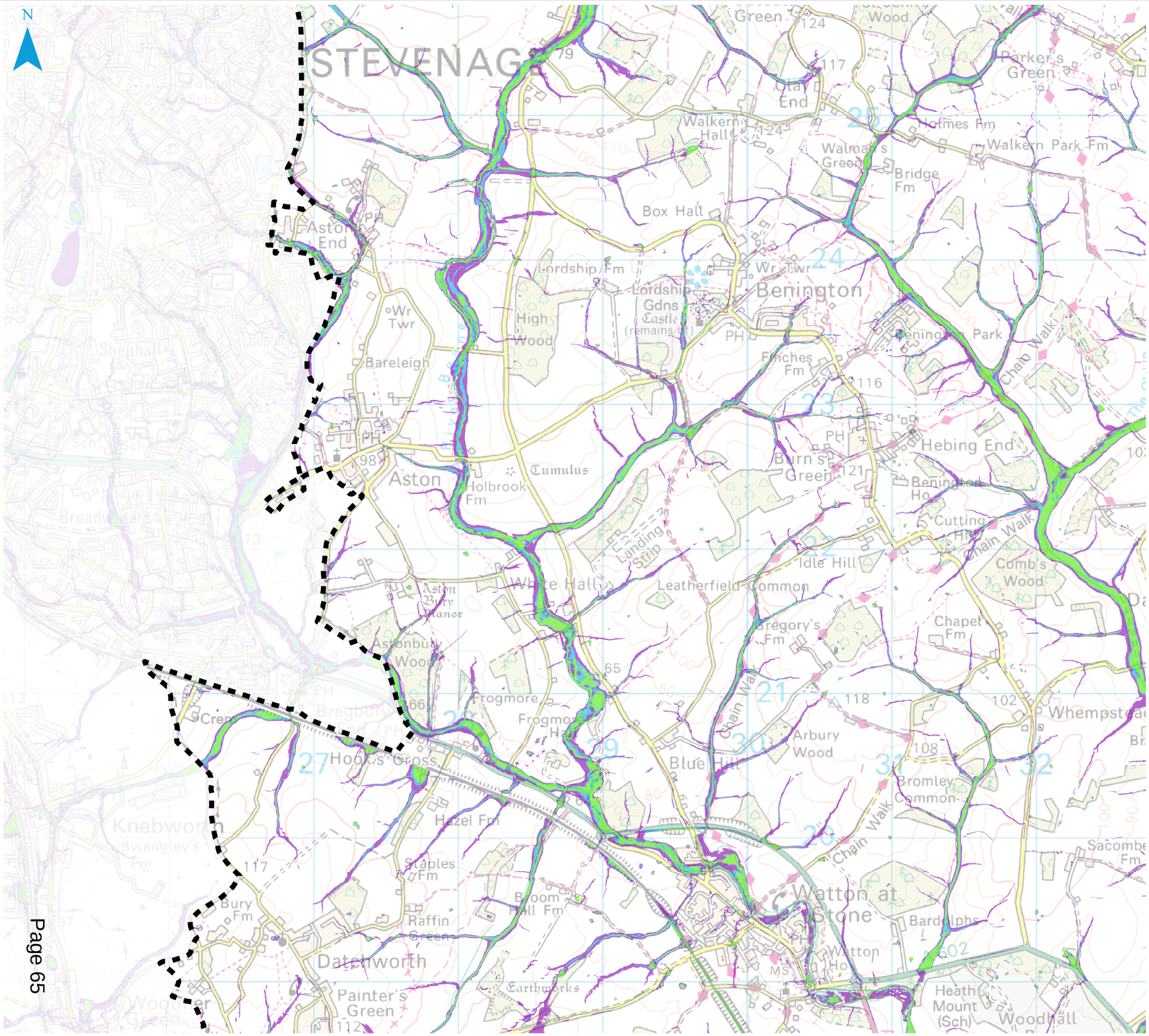


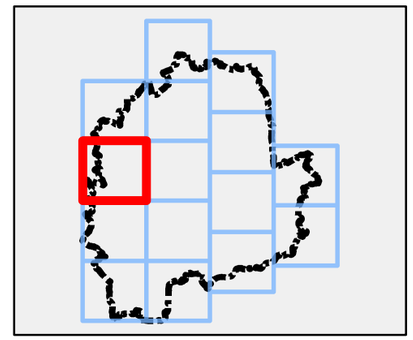
Page 65

Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
(a) is on the surface of the ground (whether or not it is moving), and
(b) has not yet entered a watercourse, drainage system or public sewer.

The uFMfSW will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.

The uFMfSW shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The uFMfSW should not be used to predict if individual properties will flood.



Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 2 of 15 Index Number: EHDC_SFRA_02

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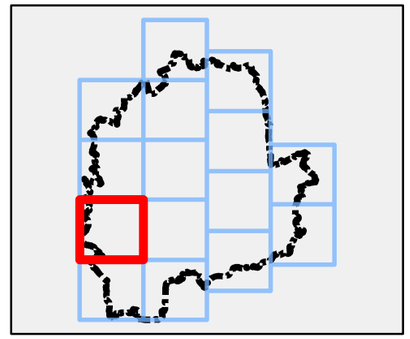
N

Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
(a) is on the surface of the ground (whether or not it is moving), and
(b) has not yet entered a watercourse, drainage system or public sewer.

The uFMfSW will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.

The uFMfSW shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The uFMfSW should not be used to predict if individual properties will flood.



Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 3 of 15 Index Number: EHDC_SFRA_03

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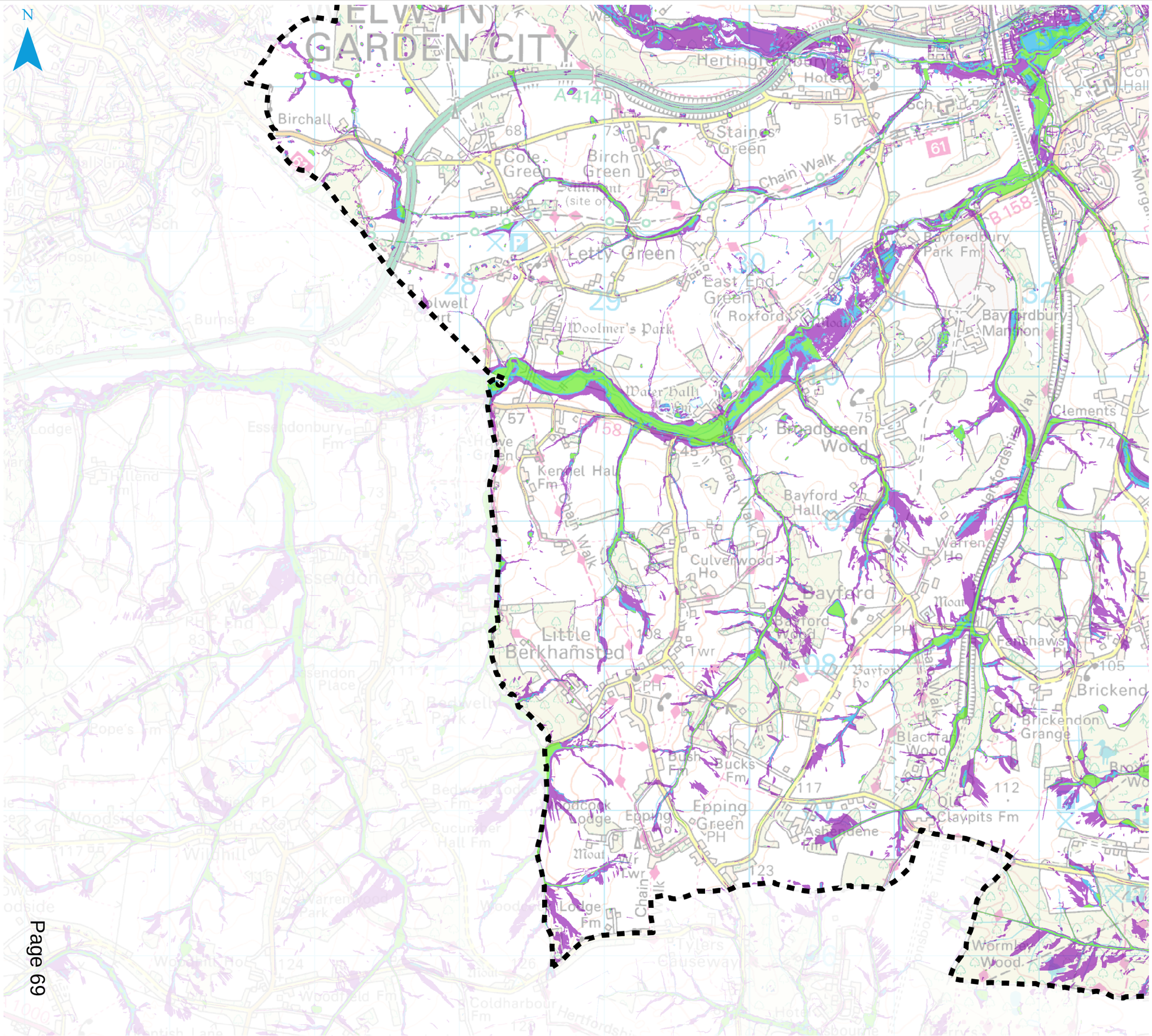


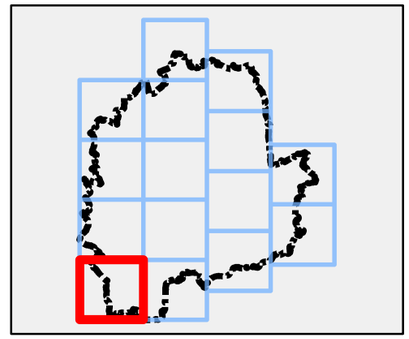
Page 69

Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
(a) is on the surface of the ground (whether or not it is moving), and
(b) has not yet entered a watercourse, drainage system or public sewer.

The uFMfSW will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.

The uFMfSW shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The uFMfSW should not be used to predict if individual properties will flood.



Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 4 of 15 Index Number: EHDC_SFRA_04

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N

Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
(a) is on the surface of the ground (whether or not it is moving), and
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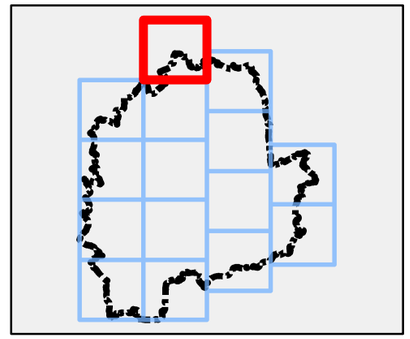

Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 5 of 15 Index Number: EHDC_SFRA_05

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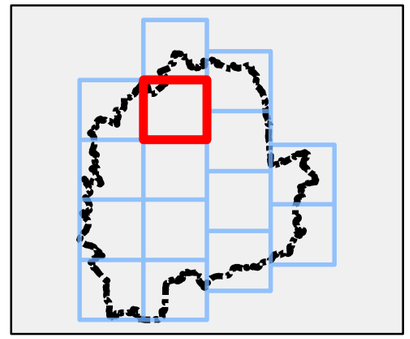
Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
(a) is on the surface of the ground (whether or not it is moving), and
(b) has not yet entered a watercourse, drainage system or public sewer.

The uFMfSW will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.

The uFMfSW shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The uFMfSW should not be used to predict if individual properties will flood.



Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 6 of 15 Index Number: EHDC_SFRA_06

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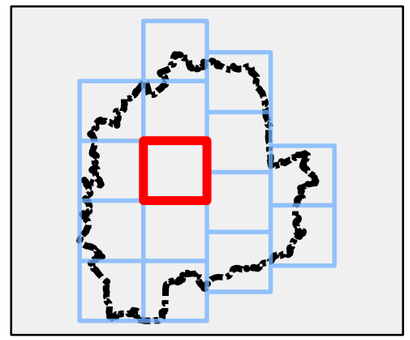
Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
(a) is on the surface of the ground (whether or not it is moving), and
(b) has not yet entered a watercourse, drainage system or public sewer.

The uFMfSW will pick out natural drainage channels, rivers, low areas in the floodplain and flow paths between buildings but it will only indicate flooding caused by local rainfall.

The uFMfSW shows predictions of flooded areas but does not show whether individual properties will be affected by surface water flooding or have been affected in the past. The uFMfSW should not be used to predict if individual properties will flood.



Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 7 of 15 Index Number: EHDC_SFRA_07

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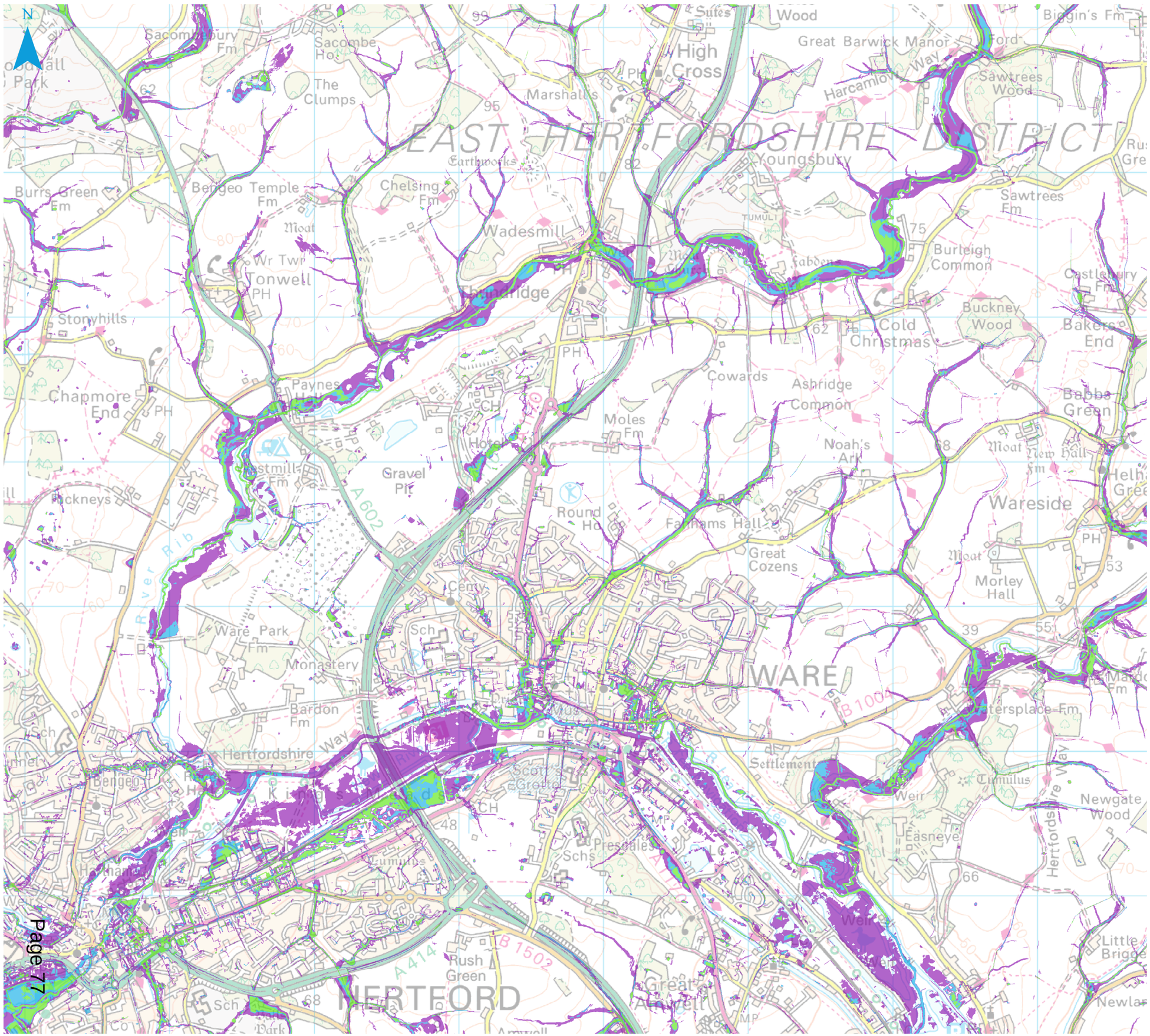

Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
(a) is on the surface of the ground (whether or not it is moving), and
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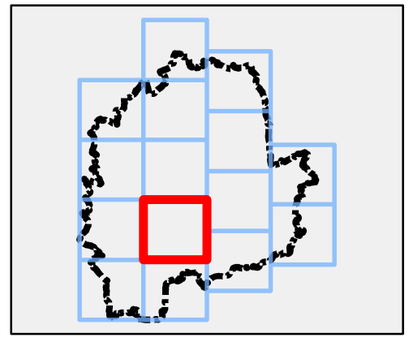

Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 8 of 15 Index Number: EHDC_SFRA_08

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Notes

The updated Flood Map for Surface Water (uFMfSW) shows the flooding that takes place from the 'surface runoff' generated by rainwater (including snow and other precipitation) which:
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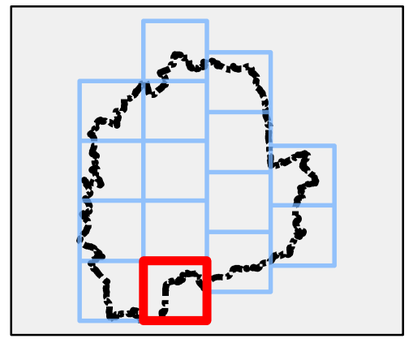

Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 9 of 15 Index Number: EHDC_SFRA_09

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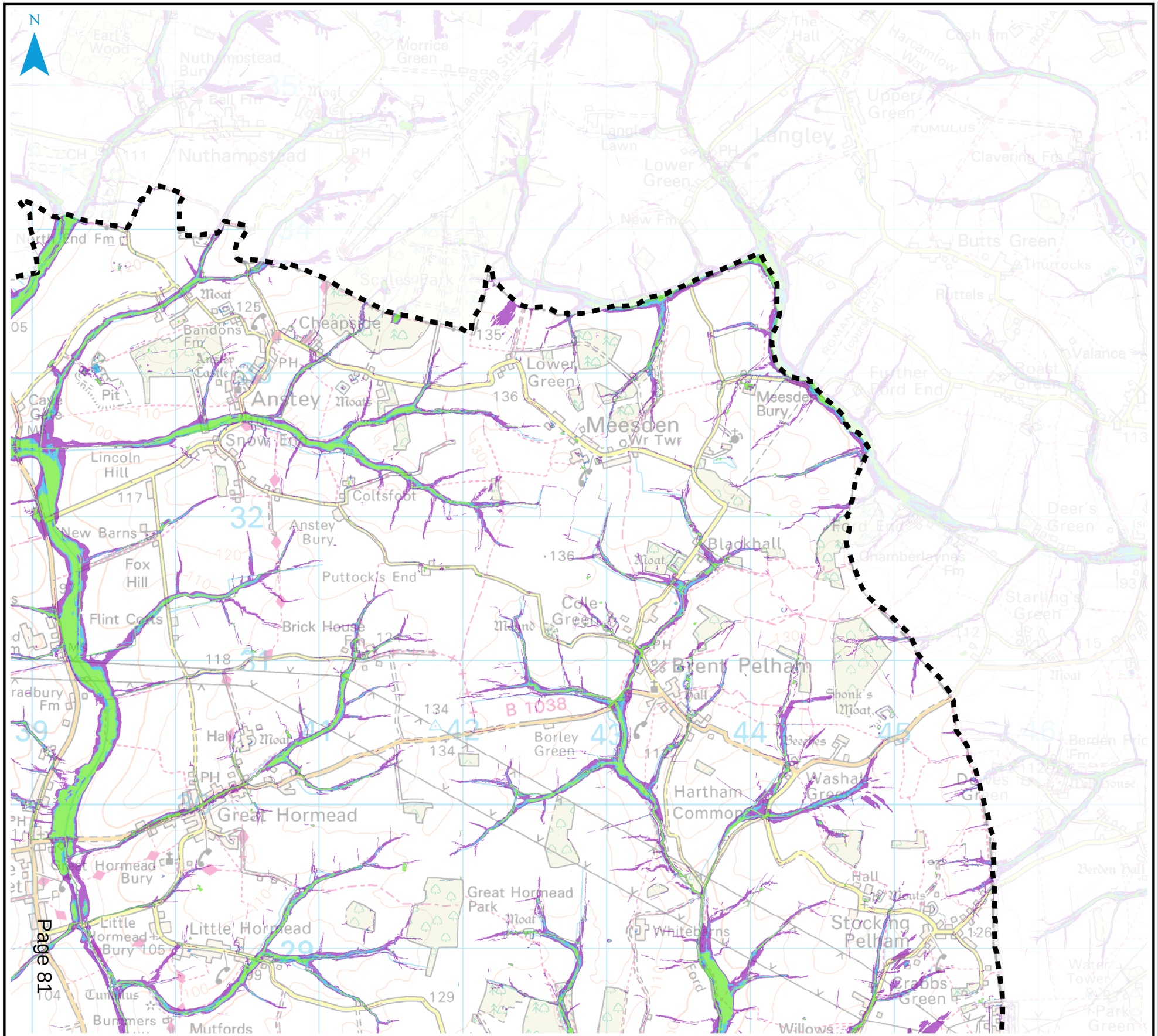
N
Nuthampstead
Morrice Green
Langley
Upper Green
Lower Green
Langley Lawn
Butts Green
Thurrocks
Ruttels
Valance
Clavering Fm
Tumulus
Scales Park
Cheapside
Bandons Fm
Moat
Anstey Castle
PH
Pit
Anstey
Lower Green
Meesden
Meesden Bury
Wr Twr
Snow End
Lincoln Hill
Coltsfoot
Anstey Bury
New Barns
Fox Hill
Puttock's End
Flint Coats
Brick House
Cole Green
Blackhall
Brent Pelham
Shonk's Moat
Hall
B 1038
Borley Green
Beeches
Washall Green
Hartham Common
Great Hormead
Great Hormead Bury
Great Hormead Park
Little Hormead
Little Hormead Bury
Whitebarns
Stocking Pelham
Crabbs Green
Willows
Mutfords
Burnmers
Tumulus
Chamberlaynes Fm
Starling's Green
Deer's Green
Berden Hall
Water Tower
Park Green
Roast Green
Further Ford End
Ford End
Ford
Hall
Moats
Moat
Mound
Ponds
Tumulus
Landing Strip
Bell Fm
Nuthampstead Burystead
Earl's Wood
Cash Fm
Harcamlow Way
Roman Road
Clavering Fm
Butts Green
Berden Priory Fm
Deer's Green
Water Tower
Park Green
Roast Green
Valance
Thurrocks
Ruttels
Further Ford End
Ford End
Chamberlaynes Fm
Starling's Green
Deer's Green
Berden Hall

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Notes

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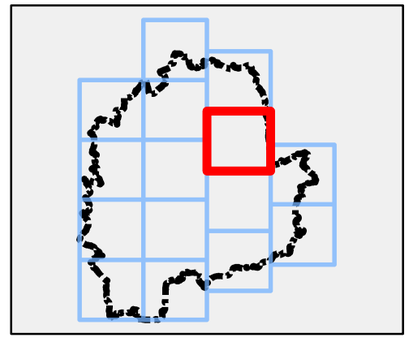

Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
C		

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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 11 of 15 Index Number: EHDC_SFRA_11

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Notes

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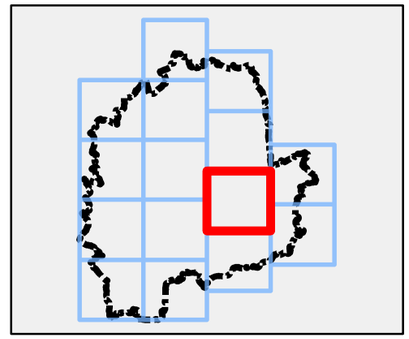

Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA
APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 12 of 15 Index Number: EHDC_SFRA_12

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Notes

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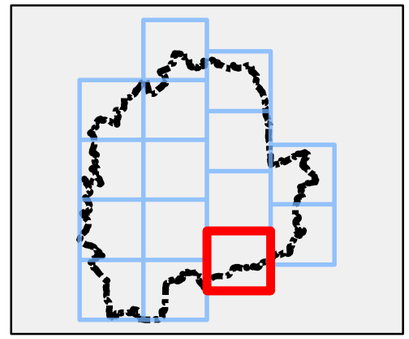

Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 13 of 15 Index Number: EHDC_SFRA_13

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Notes

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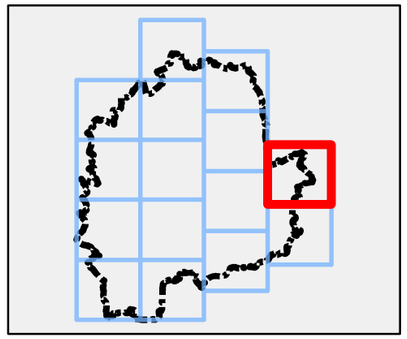

Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL SFRA

APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 14 of 15 Index Number: EHDC_SFRA_14

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Notes

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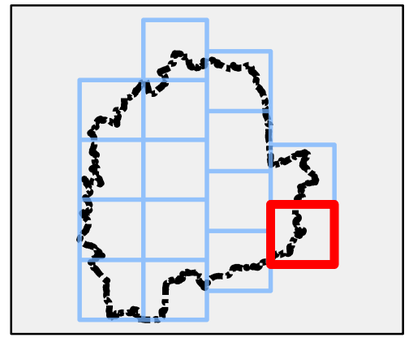

Legend

- East Hertfordshire District Council boundary
- uFMfSW* 30-year Extent
- uFMfSW* 100-year Extent
- uFMfSW* 1,000-year Extent

0 0.275 0.55 1.1 1.65 km

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APPENDIX D
SURFACE WATER FLOOD MAPS

Sheet No: 15 of 15 Index Number: EHDC_SFRA_15

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N

Notes

The Areas Susceptible to Groundwater Flooding (AStGWF) is a strategic scale map showing groundwater flood areas on a 1km square grid. The data was produced to annotate indicative Flood Risk Areas for Preliminary Flood Risk Assessment (PFRA) studies and allow the Lead Local Flood Authorities (LLFAs) to determine whether there may be a risk of flooding from groundwater.

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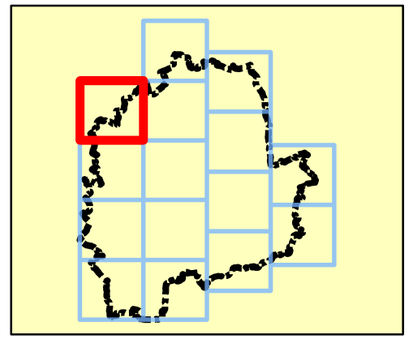
Key Plan



Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

Note:
Absence of values for any grid square means that no part of that square is identified as being susceptible to groundwater emergence.

0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 1 of 15 Index Number: EHDC_SFRA_01

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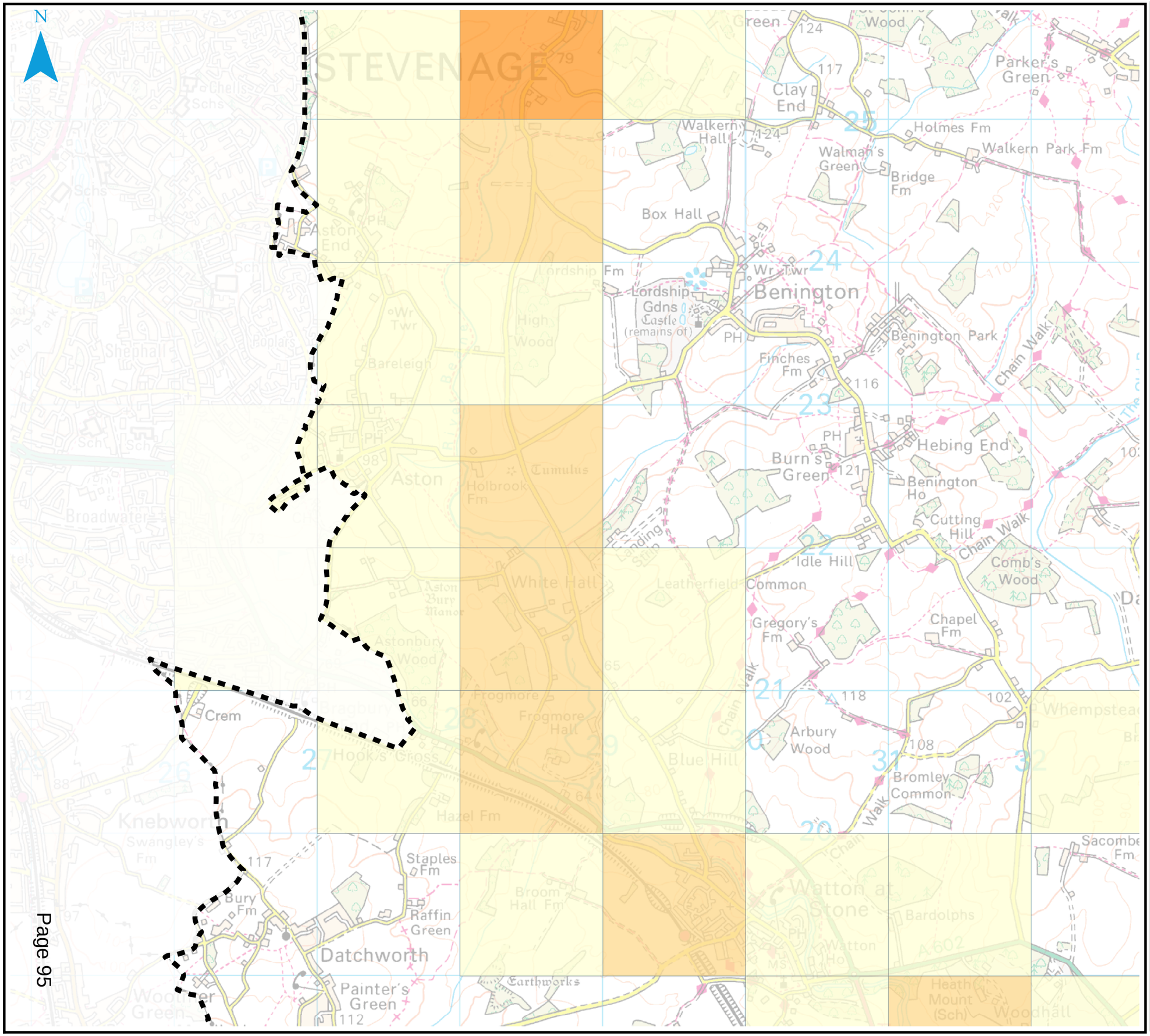

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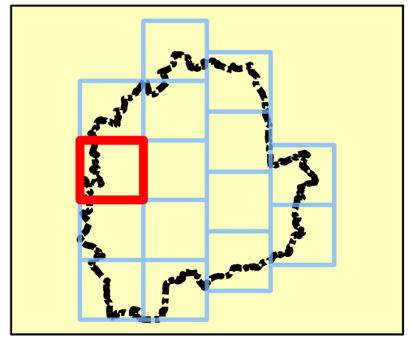

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

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0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 2 of 15 Index Number: EHDC_SFRA_02

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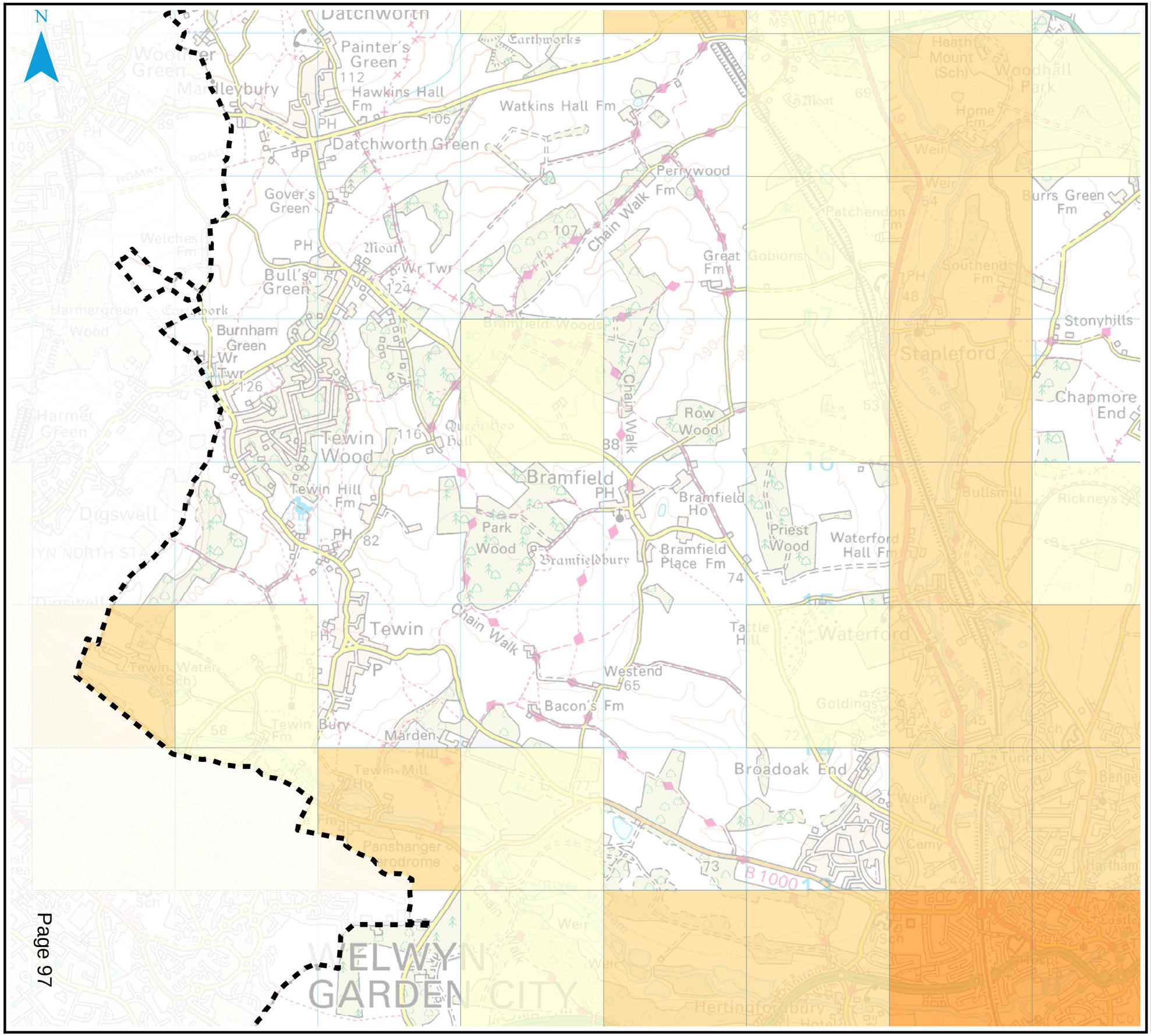

Page 97

Notes

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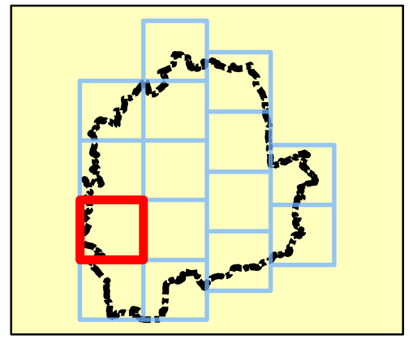

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

Note:
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0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL
APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 3 of 15 Index Number: EHDC_SFRA_03

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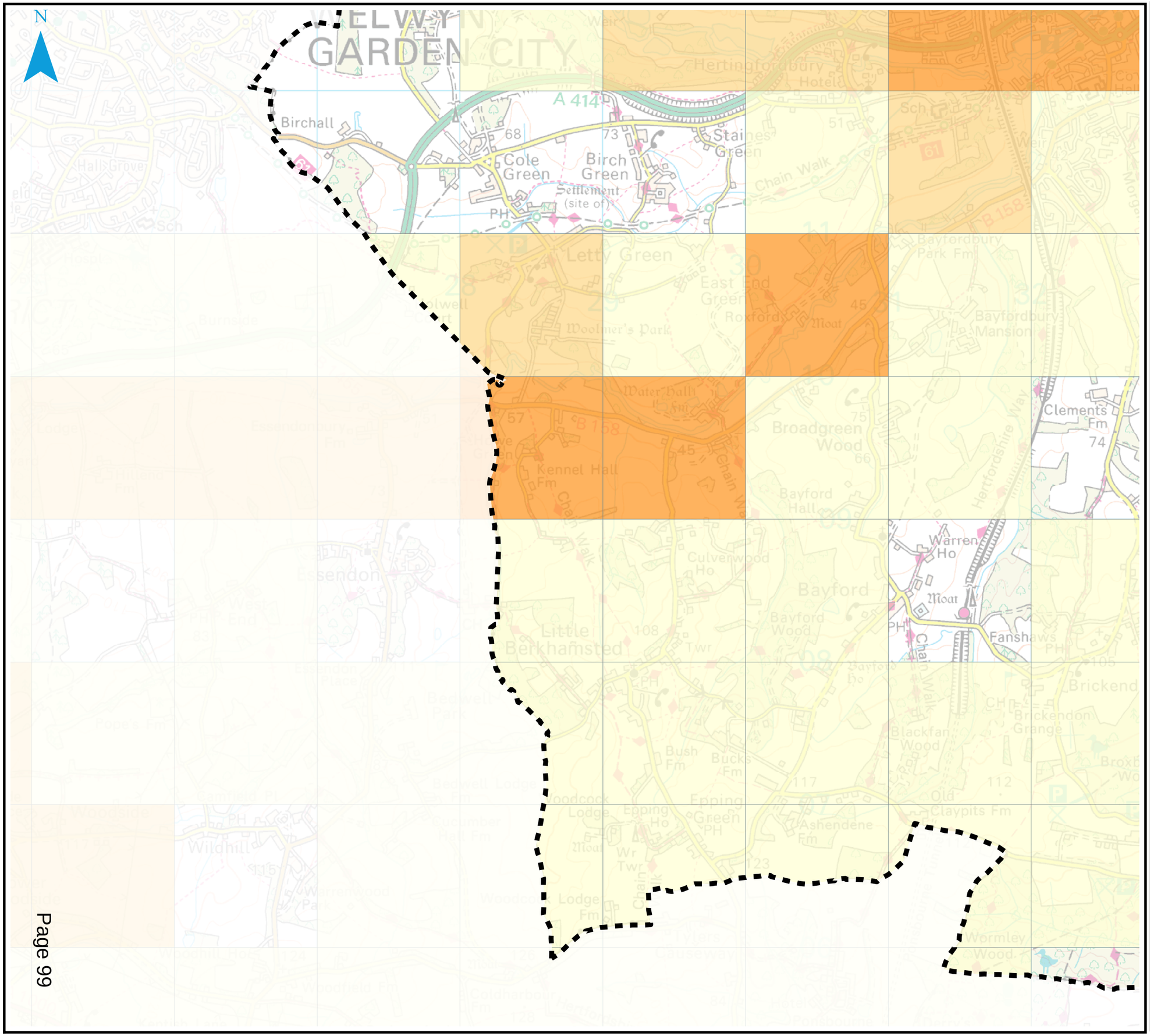

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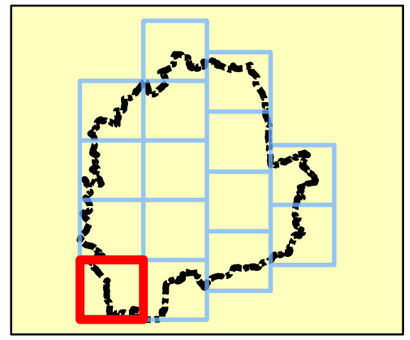

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

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- ≥ 25% < 50%
- < 25%

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APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 4 of 15 Index Number: EHDC_SFRA_04

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JBA consulting

East Herts Council

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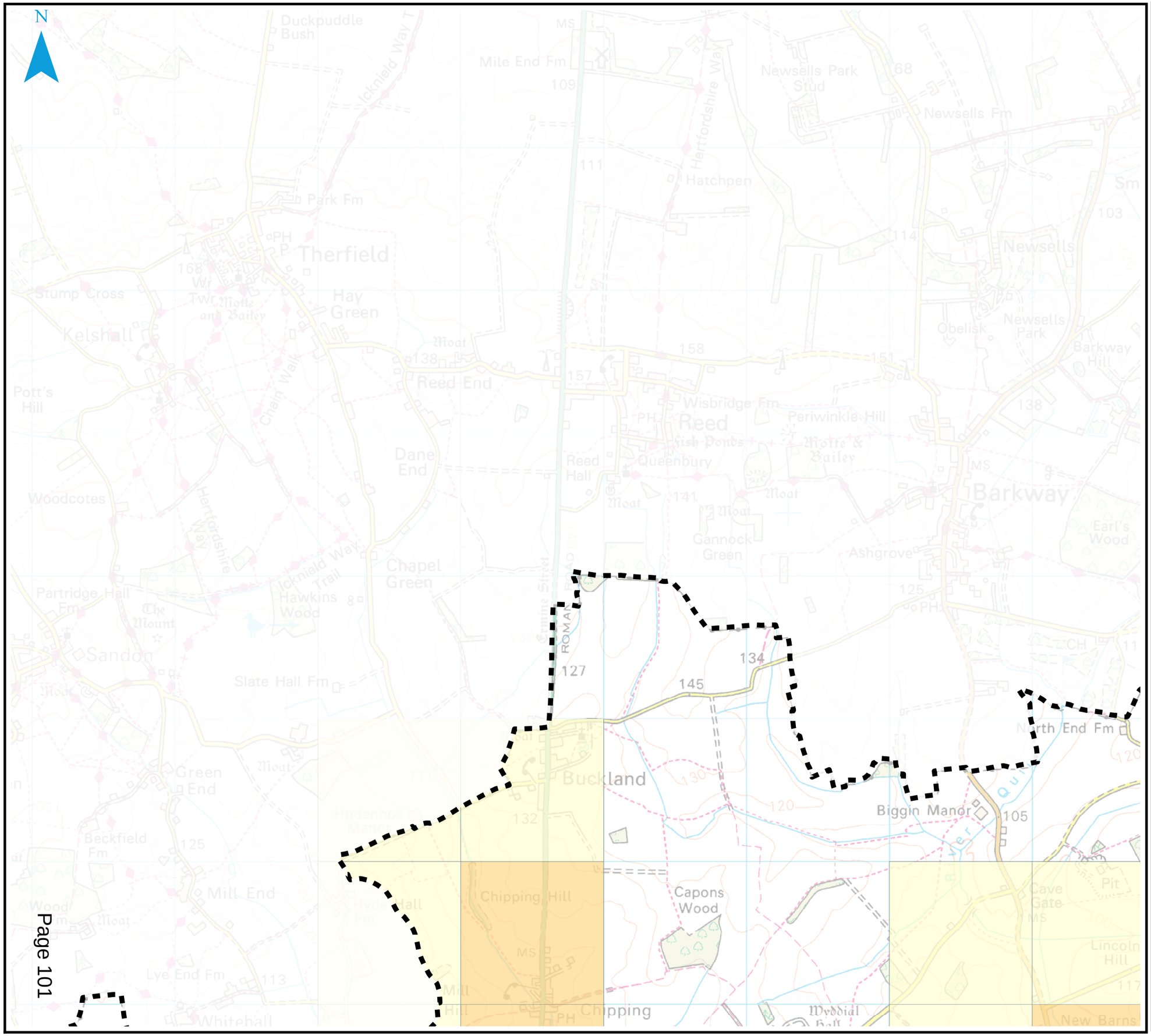

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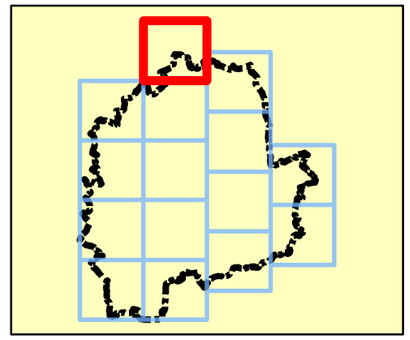

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
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Sheet No: 5 of 15 Index Number: EHDC_SFRA_05

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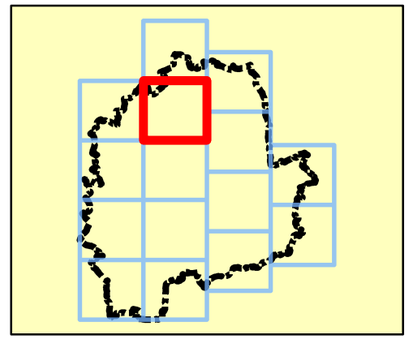

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 6 of 15 Index Number: EHDC_SFRA_06

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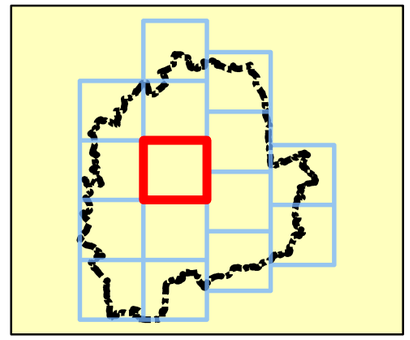

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

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- ≥ 50% <75%
- ≥ 25% < 50%
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0 0.275 0.55 1.1 1.65 km

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APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 7 of 15 Index Number: EHDC_SFRA_07

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Notes

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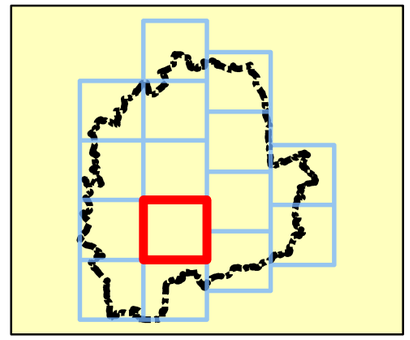
Key Plan



Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

Note:
Absence of values for any grid square means that no part of that square is identified as being susceptible to groundwater emergence.

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 2016	Draft v1.0
B	Aug 2016	Final v1.0
C		

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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 8 of 15 Index Number: EHDC_SFRA_08

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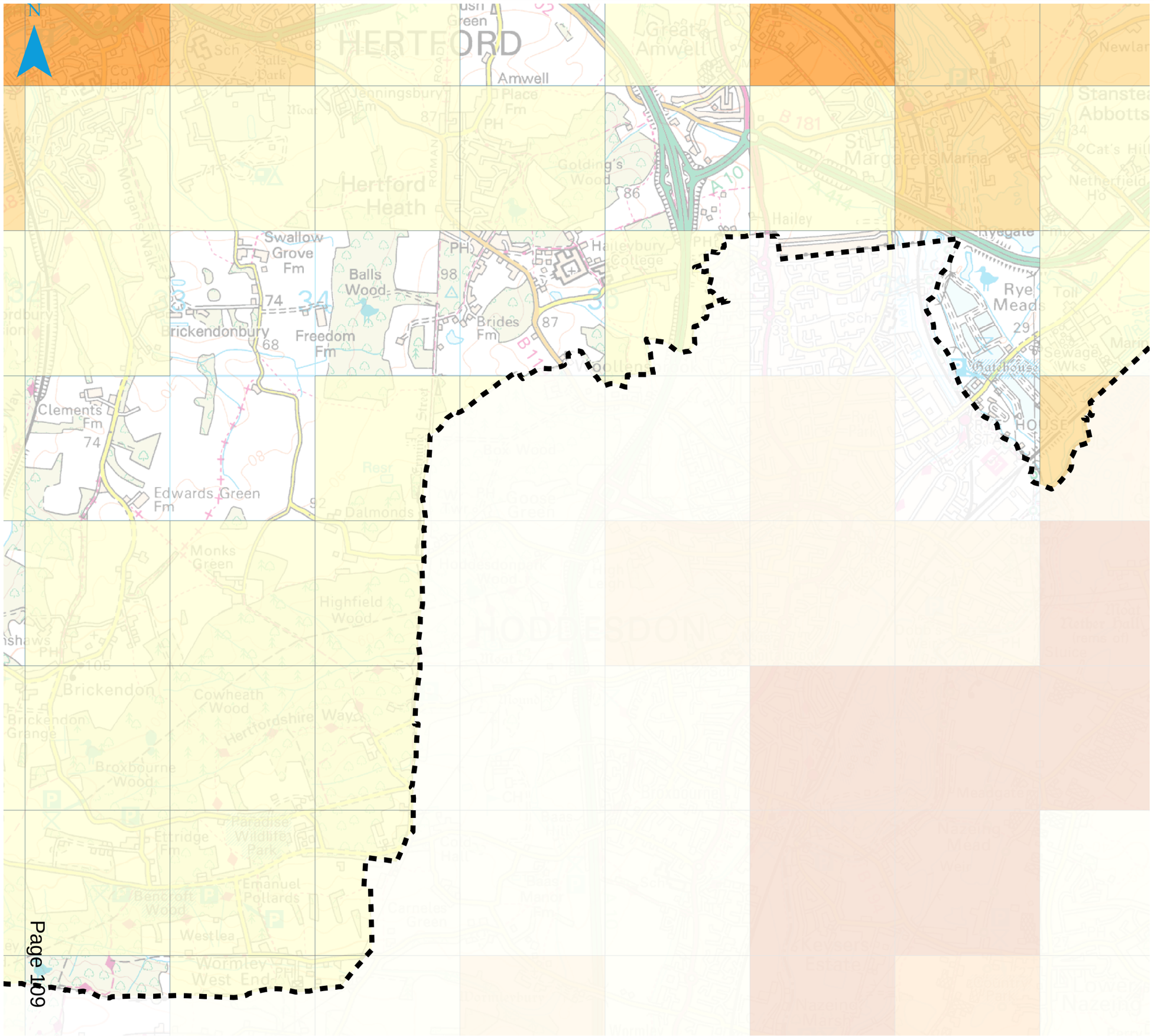

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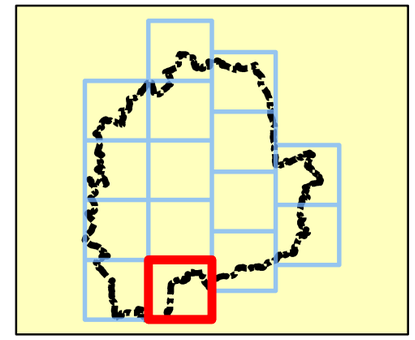

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

Note:
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0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 9 of 15 Index Number: EHDC_SFRA_09

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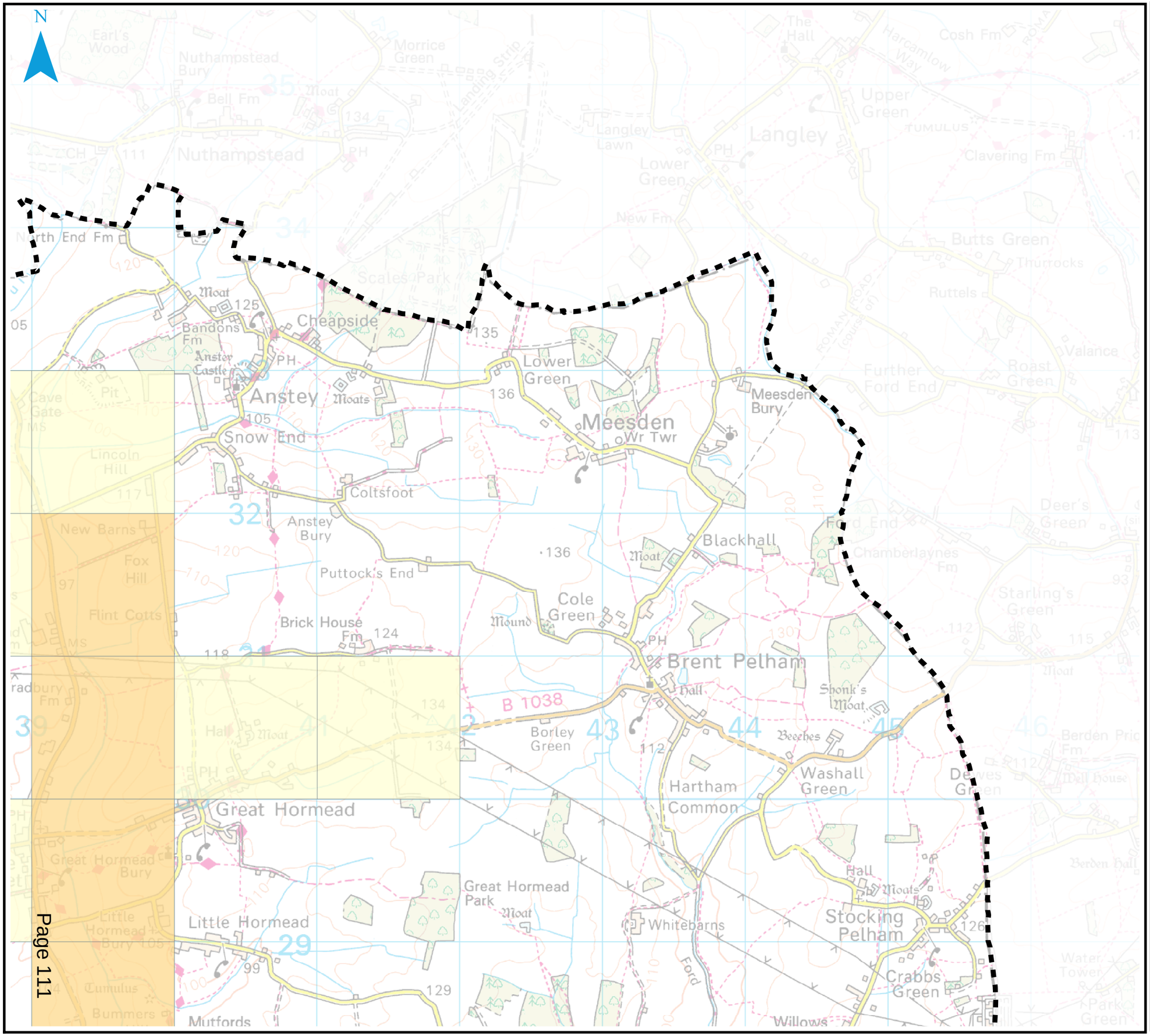

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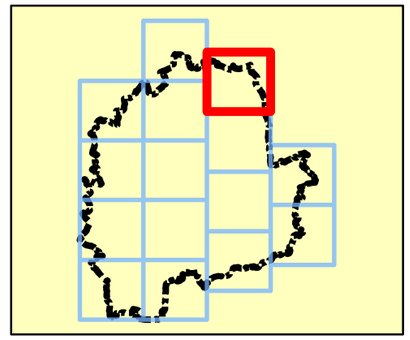

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

Note:
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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 10 of 15 Index Number: EHDC_SFRA_10

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Notes

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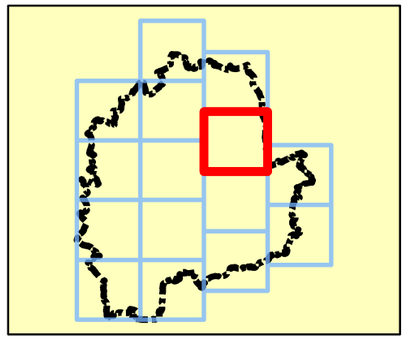

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

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- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

Note:
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0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 11 of 15 Index Number: EHDC_SFRA_11

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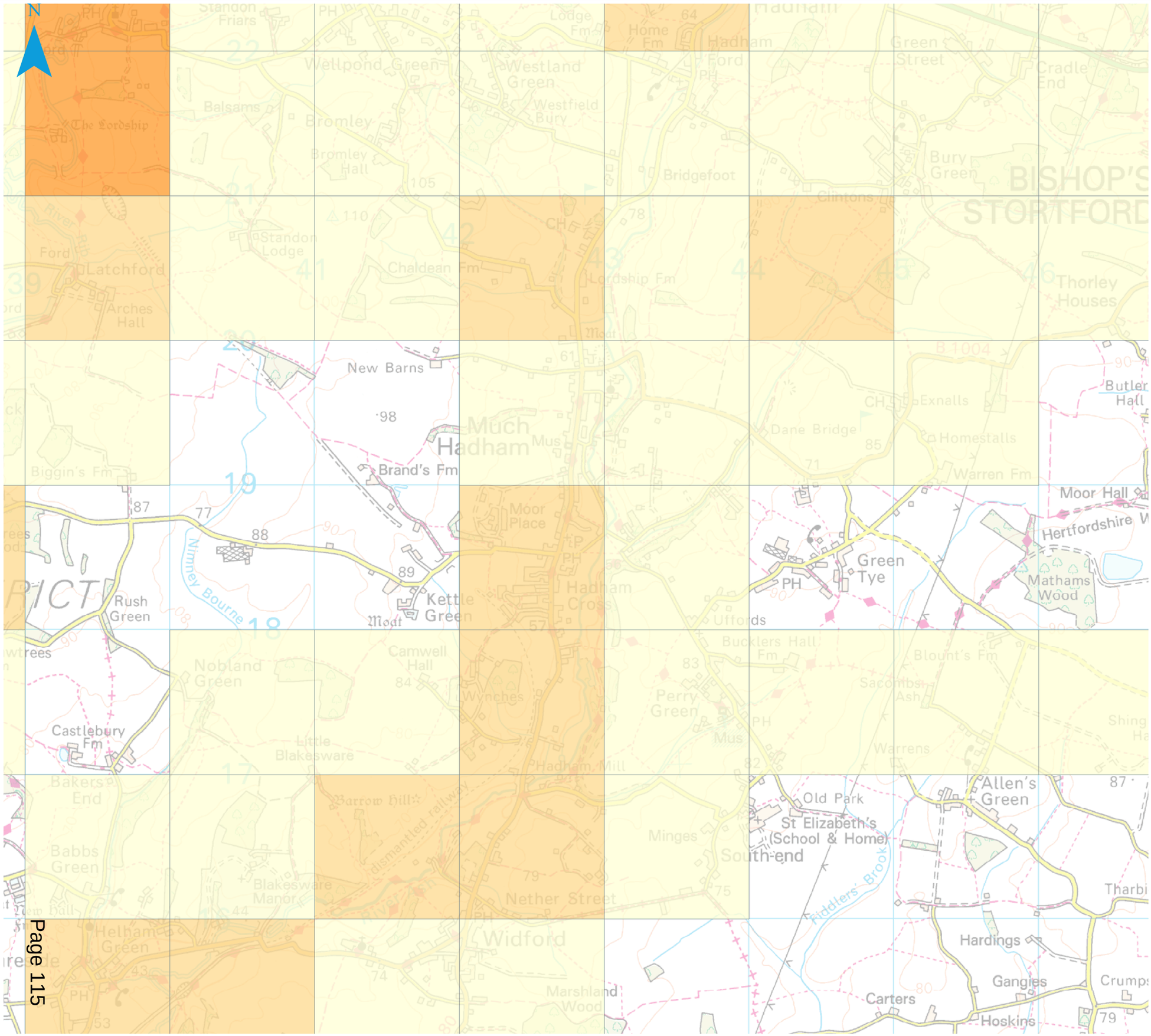

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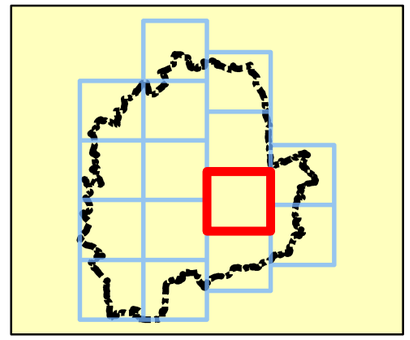

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

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- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

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0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 12 of 15 Index Number: EHDC_SFRA_12

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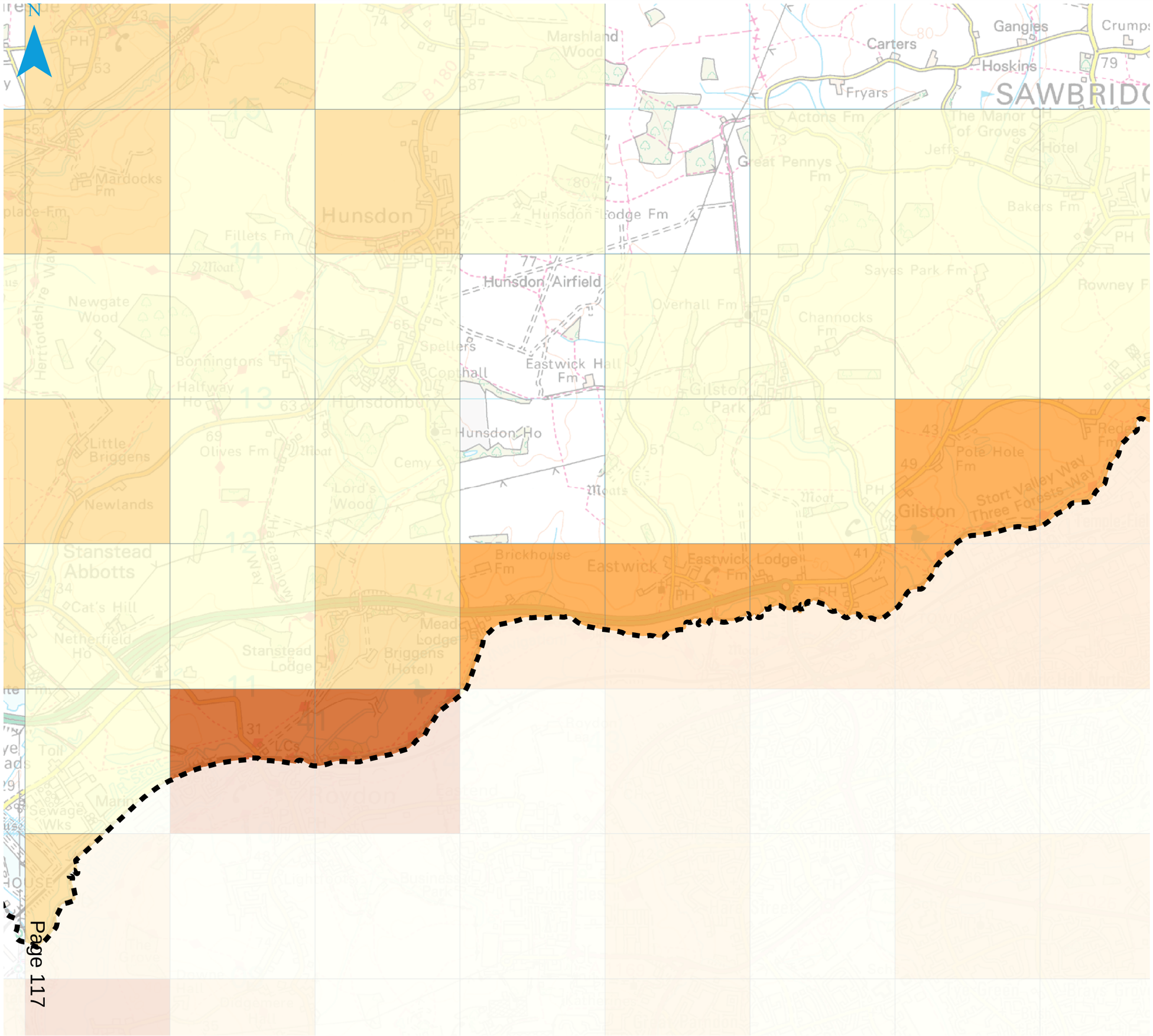

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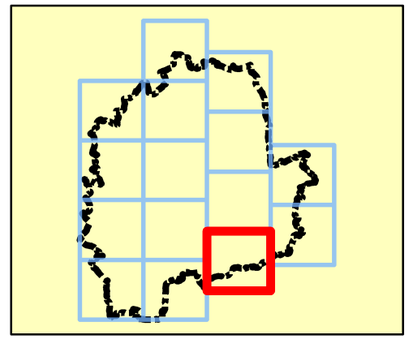

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

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0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 13 of 15 Index Number: EHDC_SFRA_13

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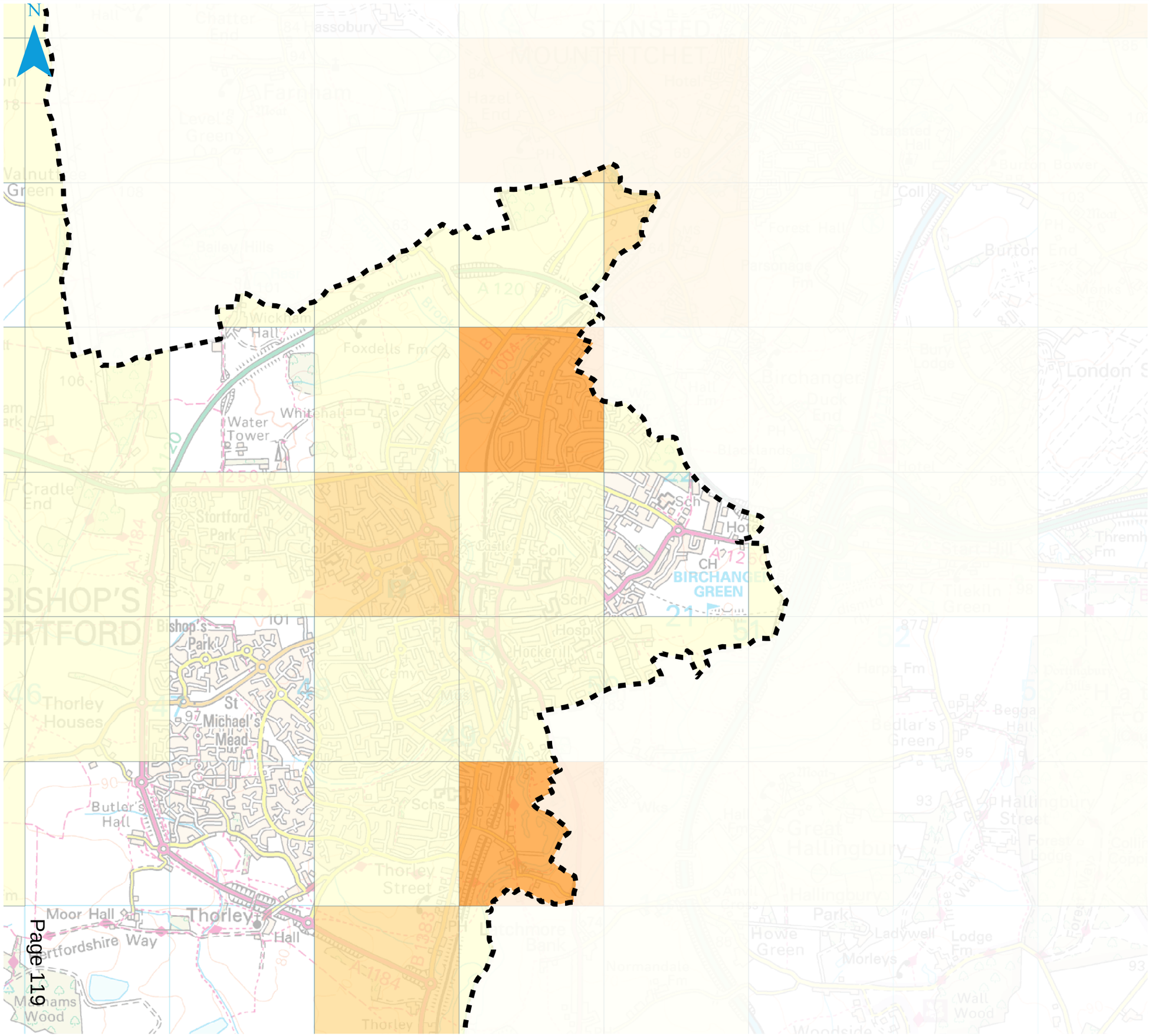

Page 119

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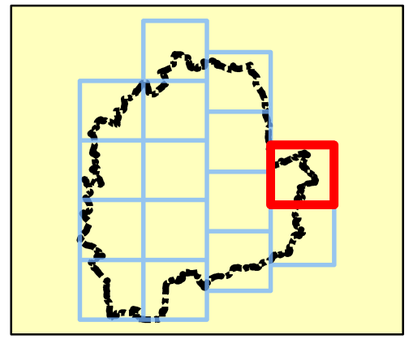

Legend

East Hertfordshire District Council boundary

Areas Susceptible to Groundwater Flooding

Classification

- ≥ 75%
- ≥ 50% <75%
- ≥ 25% < 50%
- < 25%

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0 0.275 0.55 1.1 1.65 km

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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 14 of 15 Index Number: EHDC_SFRA_14

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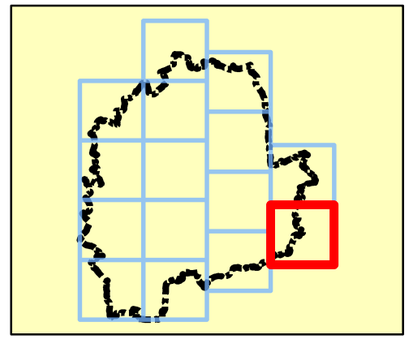

Legend

East Hertfordshire District Council boundary

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Classification

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- ≥ 50% <75%
- ≥ 25% < 50%
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APPENDIX E
GROUNDWATER FLOOD MAPS

Sheet No: 15 of 15 Index Number: EHDC_SFRA_15

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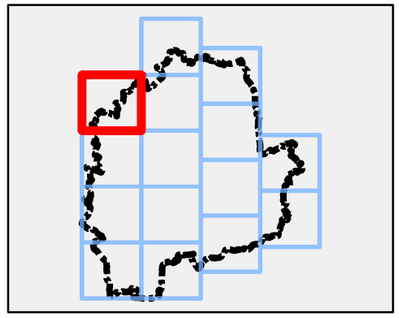
N

Notes

Flood Alerts are used to warn people of the possibility of flooding and encourage them to be alert, stay vigilant and make early preparations. It is issued earlier than a flood warning, to give customers advice notice of the possibility of flooding, but before we are fully confident that flooding in Flood Warning Areas is expected.

Flood Warnings warn people of expected flooding and encourage them to take action to protect themselves and their property.

Some areas may be covered by more than one flood warning area as they may be at risk of flooding from more than one watercourse.



Legend

Flood Warning Areas in EHDC

- 062FWF48Walkern
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 1 of 15 Index Number: EHDC_SFRA_01

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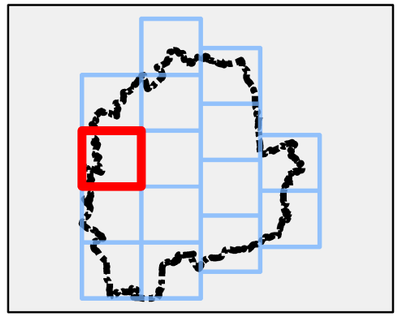

Legend

Flood Warning Areas in EHDC

- 062FWF48DaneEnd
- 062FWF48Stevenag
- 062FWF48Walkern
- 062FWF48Watton

Flood Alert Areas in EHDC

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 2 of 15 Index Number: EHDC_SFRA_02

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N

WELWYN GARDEN CITY

Notes

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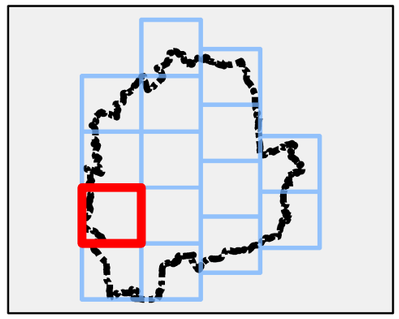

Legend

Flood Warning Areas in EHDC

- 062FWF46Hertford
- 062FWF46Lemsford
- 062FWF47Tewin
- 062FWF47Welwyn
- 062FWF48BeanHert
- 062FWF48DaneEnd
- 062FWF48Watton
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 3 of 15 Index Number: EHDC_SFRA_03

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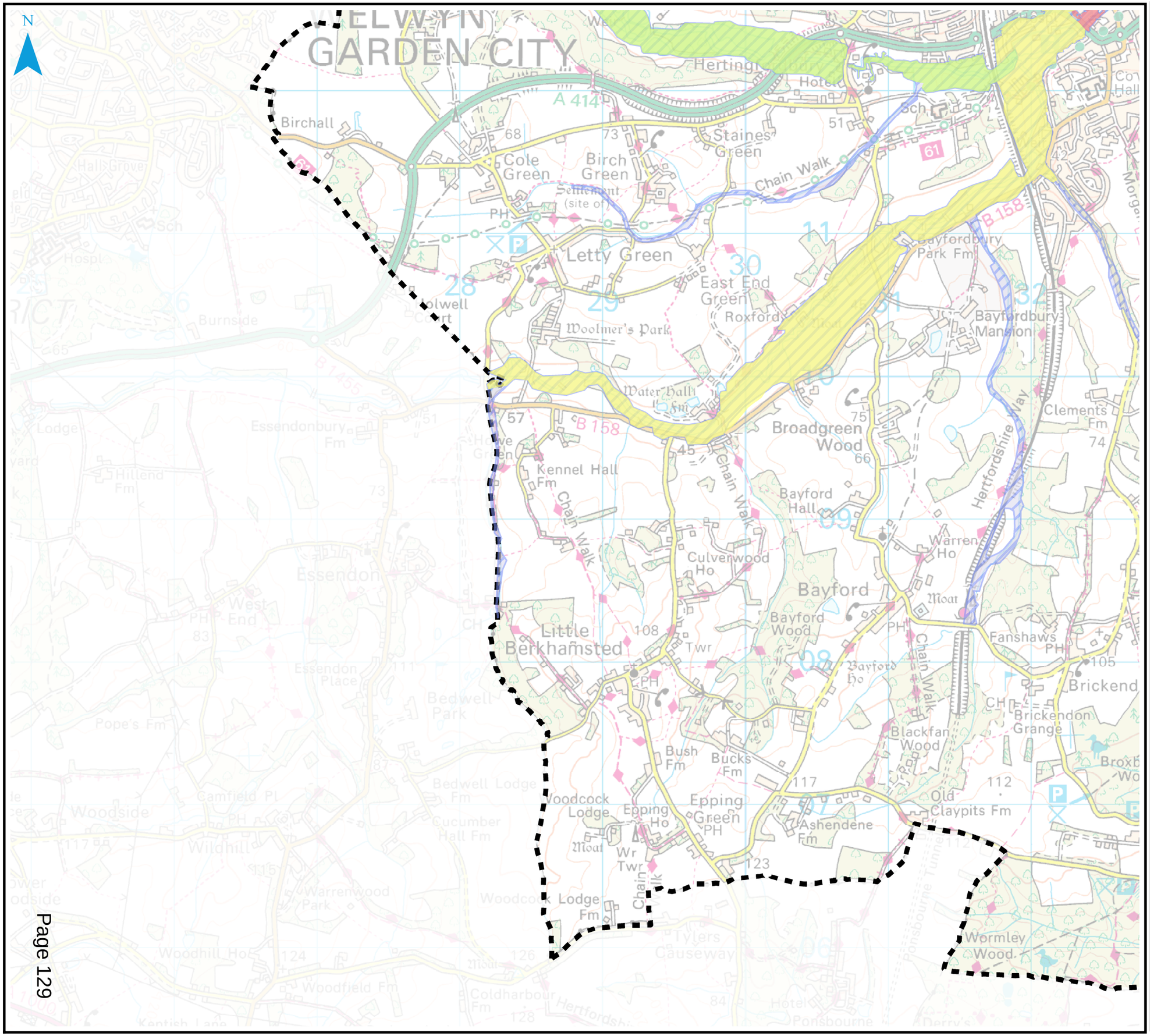

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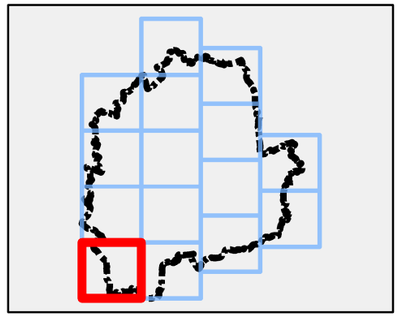

Legend

Flood Warning Areas in EHDC

- 062FWF46Hertford
- 062FWF46Lemsford
- 062FWF47Tewin
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 4 of 15 Index Number: EHDC_SFRA_04

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N

Notes

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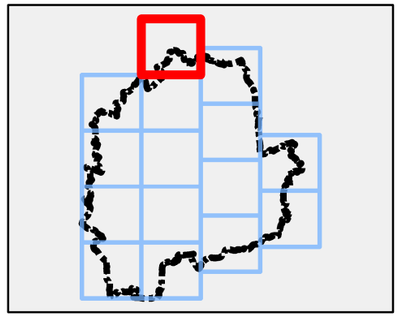

Legend

Flood Alert Areas in EHDC

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
C		

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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 5 of 15 Index Number: EHDC_SFRA_05

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Notes

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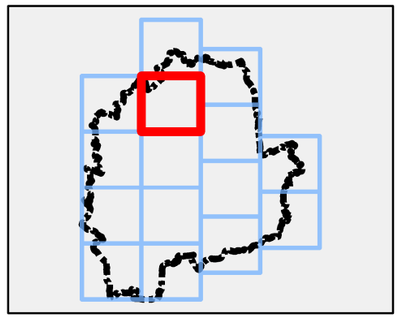

Legend

Flood Warning Areas in EHDC

- 062FWF49Braughing
- 062FWF49Buntingf
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
C		

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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 6 of 15 Index Number: EHDC_SFRA_06

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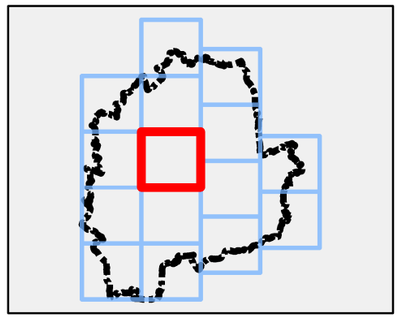

Legend

Flood Warning Areas in EHDC

- 062FWF48DaneEnd
- 062FWF49Braughing
- 062FWF49Buntingf
- 062FWF49Wadesmil
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 7 of 15 Index Number: EHDC_SFRA_07

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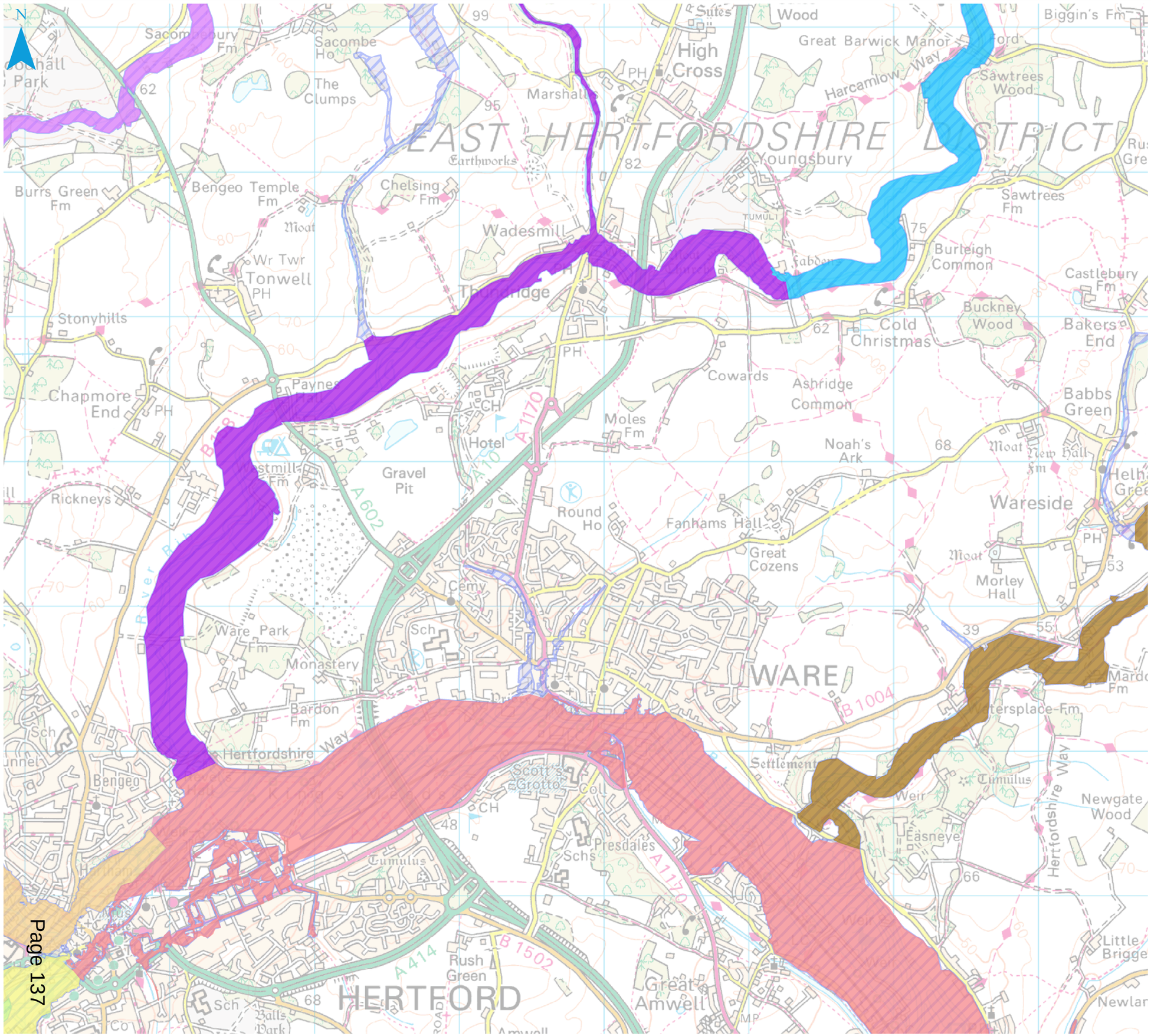

Notes

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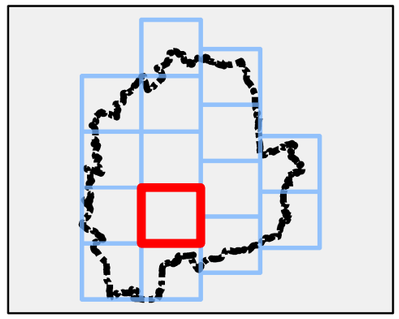

Legend

Flood Warning Areas in EHDC

- 062FWF46Hertford
- 062FWF46Lemsford
- 062FWF47Tewin
- 062FWF48BeanHert
- 062FWF48DaneEnd
- 062FWF49Buntingf
- 062FWF49Wadesmil
- 062FWF50Hadhams
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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C		

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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 8 of 15 Index Number: EHDC_SFRA_08

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Notes

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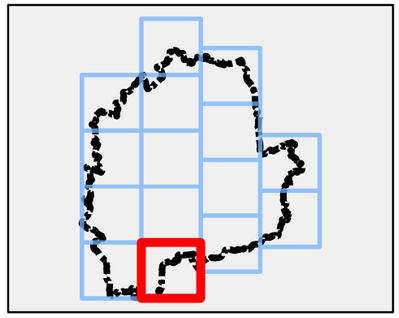

Legend

Flood Warning Areas in EHDC

- 062FWF46Hertford
- 062FWF46Lemsford
- 062FWF47Tewin
- 062FWF51Harlow
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 9 of 15 Index Number: EHDC_SFRA_09

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N

Notes

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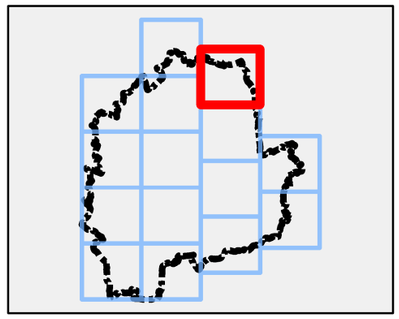

Legend

Flood Warning Areas in EHDC

062FWF50FurneuxP

Flood Alert Areas in EHDC

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 10 of 15 Index Number: EHDC_SFRA_10

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Notes

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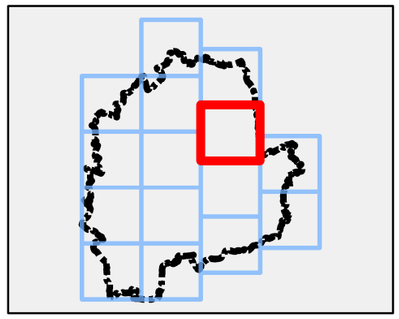

Legend

Flood Warning Areas in EHDC

- 062FWF49Braughing
- 062FWF49Buntingf
- 062FWF50FurneuxP
- 062FWF50Hadhams
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 11 of 15 Index Number: EHDC_SFRA_11

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Notes

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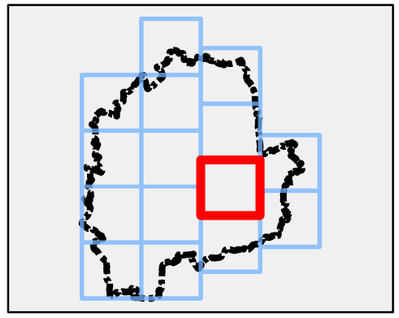

Legend

Flood Warning Areas in EHDC

- 062FWF49Buntingf
- 062FWF50Hadhams
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 12 of 15 Index Number: EHDC_SFRA_12

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Notes

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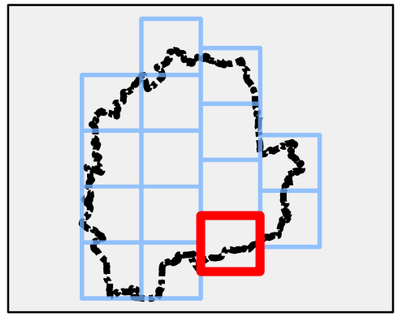

Legend

Flood Warning Areas in EHDC

- 062FWF46Hertford
- 062FWF50Hadhams
- 062FWF51Harlow
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
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EAST HERTFORDSHIRE COUNCIL SFRA

APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 13 of 15 Index Number: EHDC_SFRA_13

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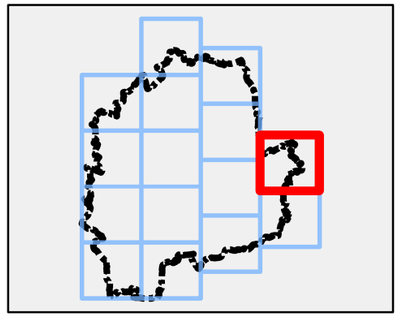

Legend

Flood Warning Areas in EHDC

- 062FWF51Bishop
- 062FWF51Claverin
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 14 of 15 Index Number: EHDC_SFRA_14

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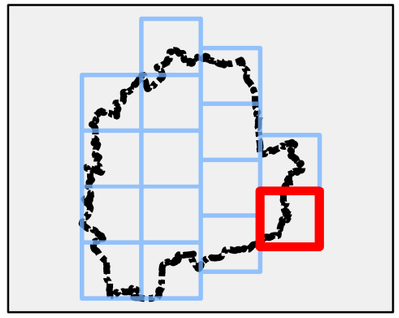

Legend

Flood Warning Areas in EHDC

- 062FWF51Bishop
- 062FWF51Harlow
- 062FWF51Sawbridg
- Flood Alert Areas in EHDC
- East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v.1.0
B	Aug 16	Final v.1.0
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APPENDIX F
FLOOD WARNING COVERAGE

Sheet No: 15 of 15 Index Number: EHDC_SFRA_15

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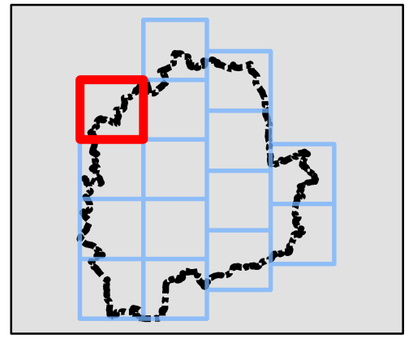
Notes

Mapping indicating flooding from reservoir sources has been developed based on Environment Agency supplied National Inundation Reservoir Mapping dataset.

Please note that the reservoir inundation outlines shown in the mapping are made up of reservoirs which are located outside the East Hertfordshire District Council's adminstrative area.

For further information developers should contact the Environment Agency.

Key Plan



Legend

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
B	Aug 16	Final v1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX G
FLOODING FROM RESERVOIRS

Sheet No: 1 of 15 Index Number: EHDC_SFRA_01

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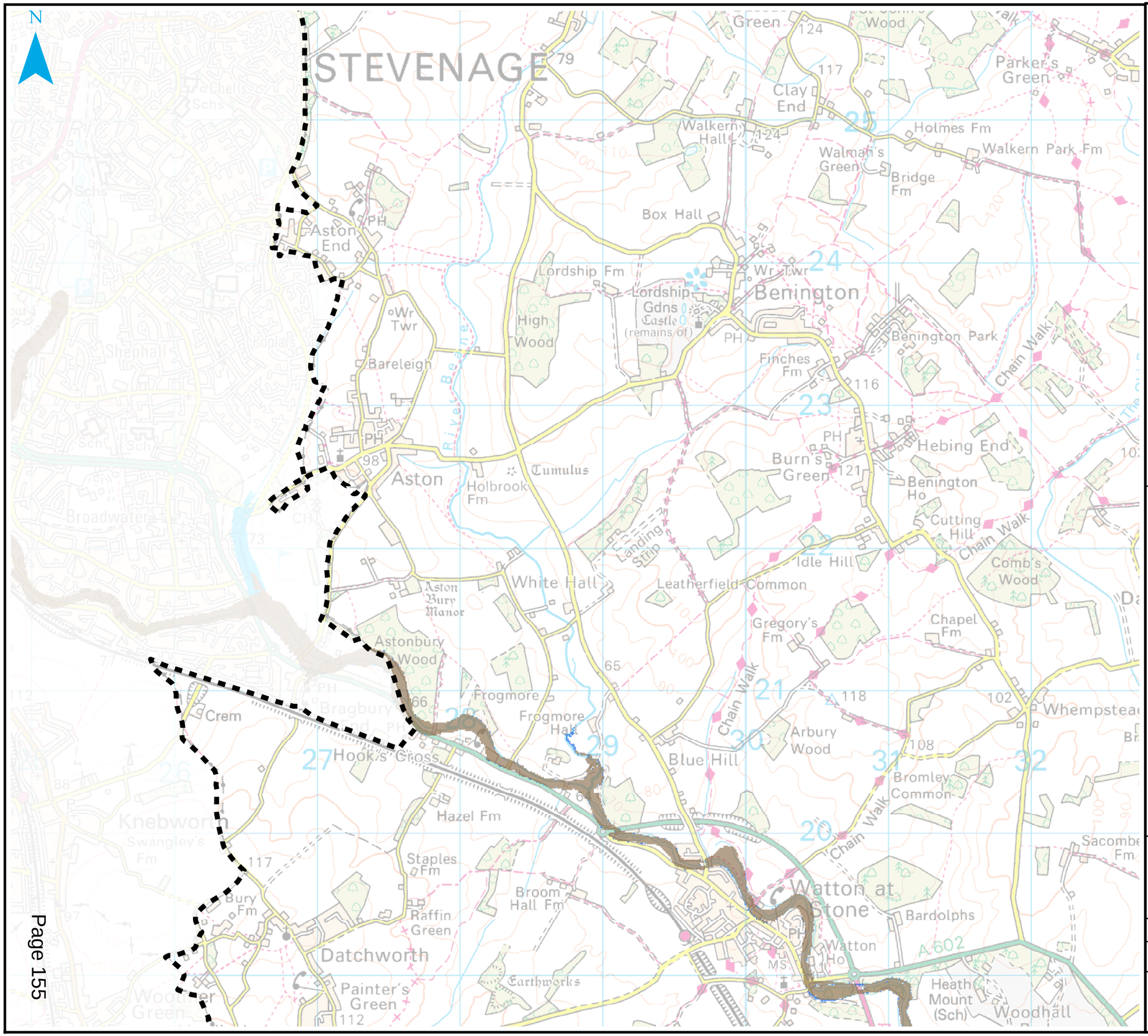

Page 155

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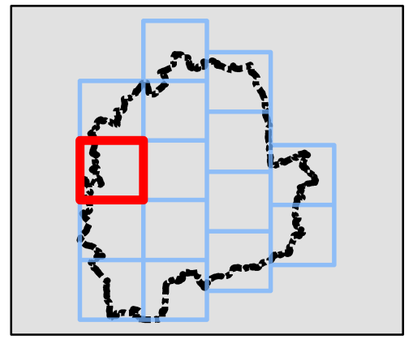
Key Plan



Legend

East Hertfordshire District Council boundary

Reservoir Inundation Extent

- Aston Valley FSA
- Fairlands Lake
- Ridlins Wood FSA
- Wychdell FSA

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
B	Aug 16	Final v1.0
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APPENDIX G
FLOODING FROM RESERVOIRS

Sheet No: 2 of 15 Index Number: EHDC_SFRA_02

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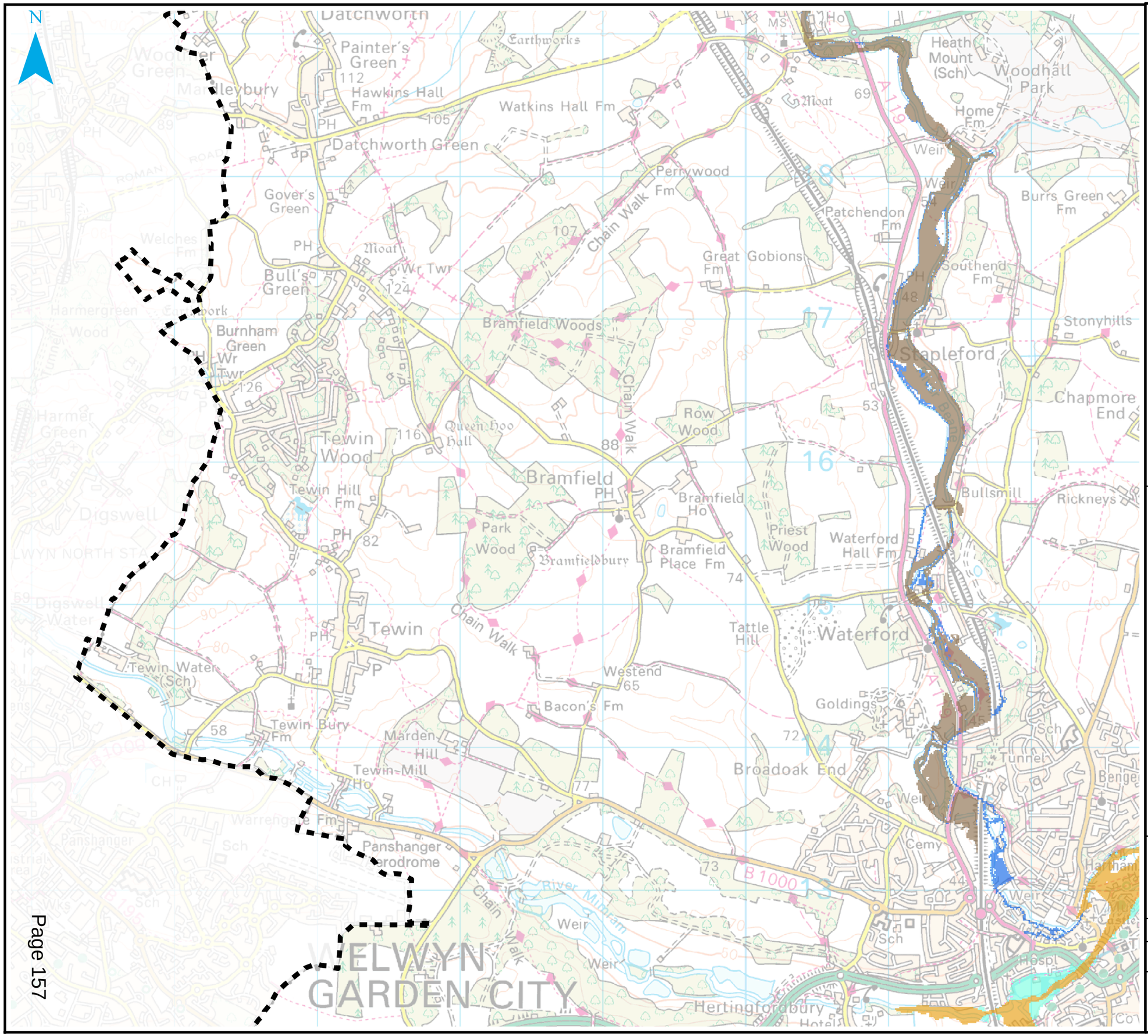

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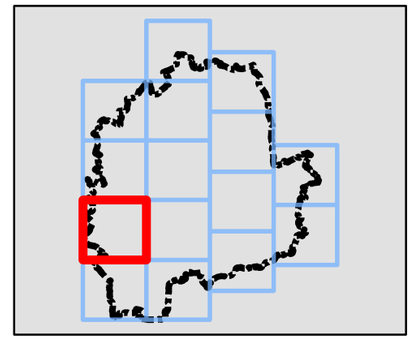
Key Plan



Legend

East Hertfordshire District Council boundary

Reservoir Inundation Extent

- Aston Valley FSA
- Brocket Hall Lake
- Fairlands Lake
- Luton Hoo Lake Lower
- Ridlins Wood FSA
- The Broadwater
- Wychdell FSA

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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B	Aug 16	Final v1.0
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APPENDIX G
FLOODING FROM RESERVOIRS

Sheet No: 3 of 15 Index Number: EHDC_SFRA_03

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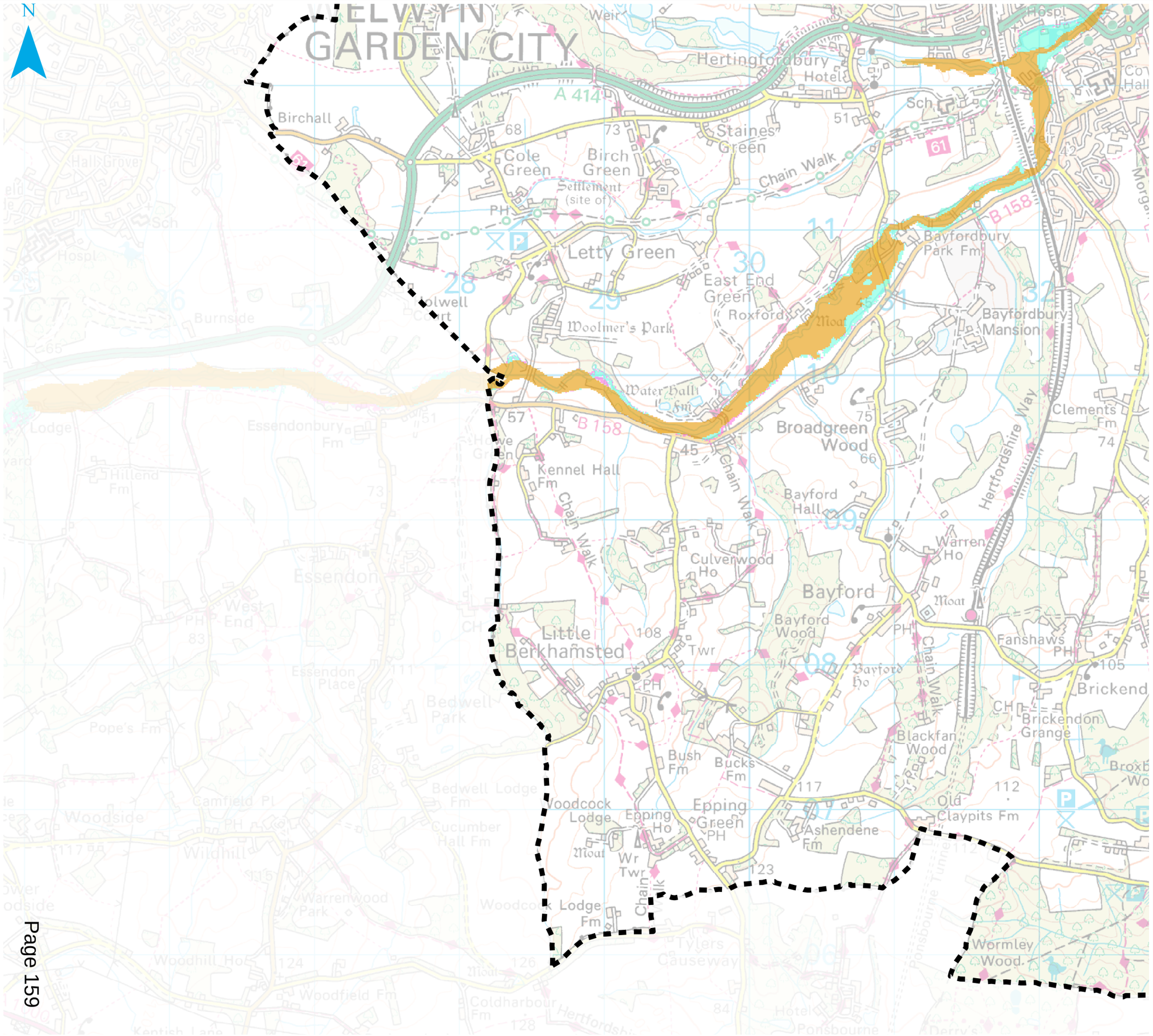

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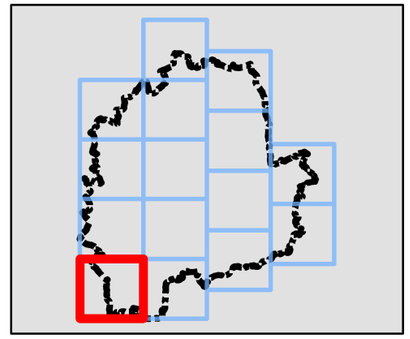
Key Plan



Legend

East Hertfordshire District Council boundary

Reservoir Inundation Extent

- Brocket Hall Lake
- Luton Hoo Lake Lower
- The Broadwater

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
A	Aug 16	Draft v1.0
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EAST HERTFORDSHIRE DISTRICT COUNCIL

APPENDIX G
FLOODING FROM RESERVOIRS

Sheet No: 4 of 15 Index Number: EHDC_SFRA_04

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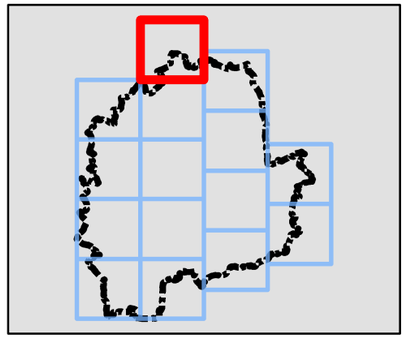
For further information developers should contact the Environment Agency.

Key Plan



Legend

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

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APPENDIX G
FLOODING FROM RESERVOIRS

Sheet No: 5 of 15 Index Number: EHDC_SFRA_05

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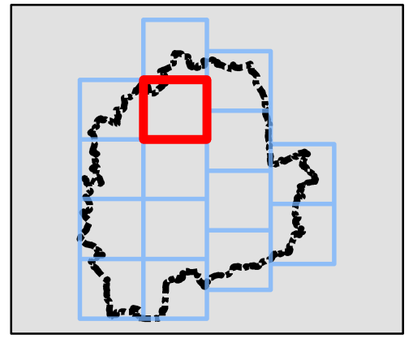
Key Plan



Legend

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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APPENDIX G
FLOODING FROM RESERVOIRS

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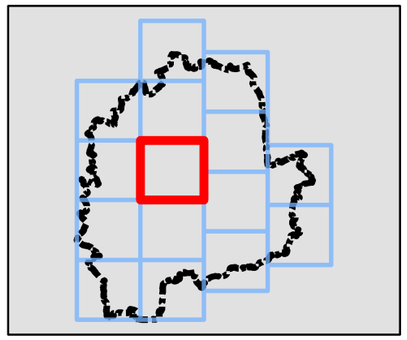
Key Plan



Legend

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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APPENDIX G
FLOODING FROM RESERVOIRS

Sheet No: 7 of 15 Index Number: EHDC_SFRA_07

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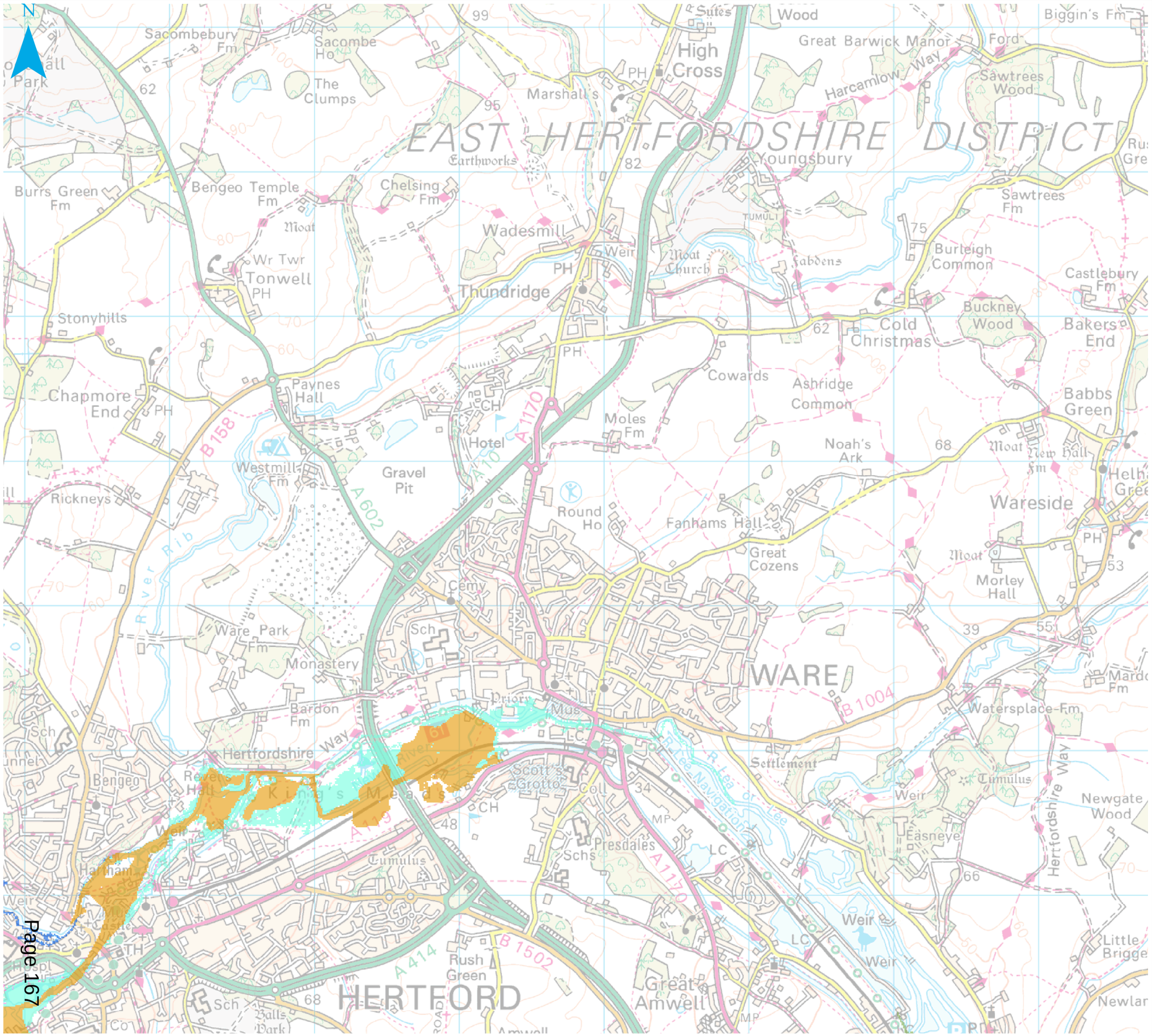

Notes

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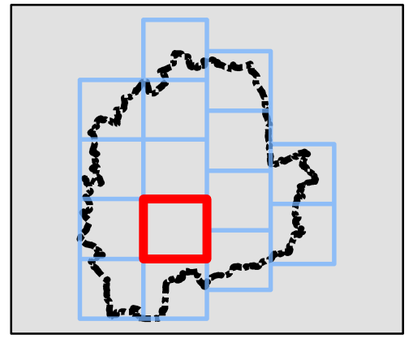
Key Plan



Legend

East Hertfordshire District Council boundary

Reservoir Inundation Extent

- Brocket Hall Lake
- Luton Hoo Lake Lower
- Rye Meads Lagoons 11, 13, 15 & 17
- The Broadwater
- Wychdell FSA

0 0.275 0.55 1.1 1.65 km

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APPENDIX G
FLOODING FROM RESERVOIRS

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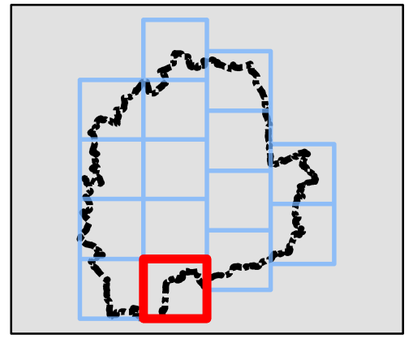
Key Plan



Legend

East Hertfordshire District Council boundary

Reservoir Inundation Extent

- Brocket Hall Lake
- Luton Hoo Lake Lower
- Rye Meads Lagoons 10, 12, 14 & 16
- Rye Meads Lagoons 11, 13, 15 & 17
- The Broadwater

0 0.275 0.55 1.1 1.65 km

REF	Date	Comments
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APPENDIX G
FLOODING FROM RESERVOIRS

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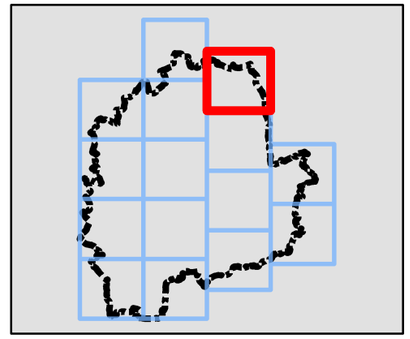
Key Plan



Legend

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

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APPENDIX G
FLOODING FROM RESERVOIRS

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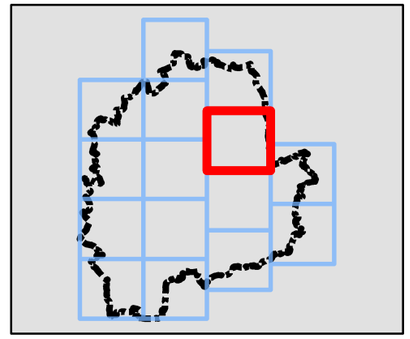

Legend

East Hertfordshire District Council boundary

0 0.275 0.55 1.1 1.65 km

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APPENDIX G
FLOODING FROM RESERVOIRS

Sheet No: 11 of 15 Index Number: EHDC_SFRA_11

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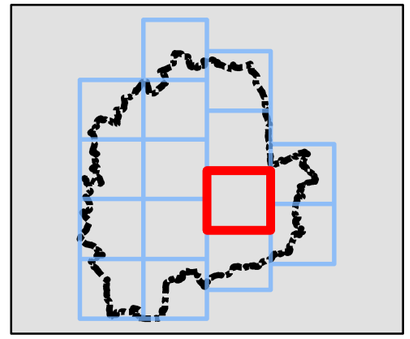

Legend

East Hertfordshire District Council boundary

Reservoir Inundation Extent

Lancaster Lake

0 0.275 0.55 1.1 1.65 km

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APPENDIX G
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Sheet No: 12 of 15 Index Number: EHDC_SFRA_12

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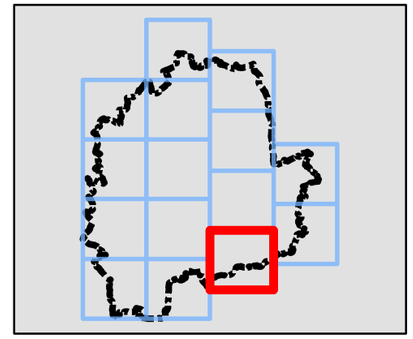
Key Plan



Legend

East Hertfordshire District Council boundary

Reservoir Inundation Extent

- Balancing Pond C
- Bonnington's Lake
- Hatfield Forest Lake
- Lancaster Lake
- Rye Meads Lagoons 10, 12, 14 & 16
- Rye Meads Lagoons 11, 13, 15 & 17
- Shrubbs Farm Reservoir (ID395)

0 0.275 0.55 1.1 1.65 km

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APPENDIX G
FLOODING FROM RESERVOIRS

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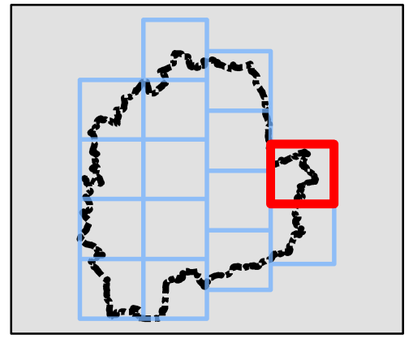
Key Plan



Legend

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Reservoir Inundation Extent

Bomb Pond

Lancaster Lake

0 0.275 0.55 1.1 1.65 km

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APPENDIX G
FLOODING FROM RESERVOIRS

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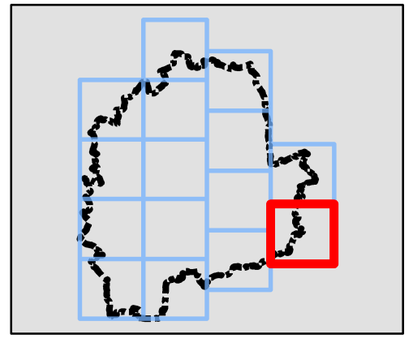
Key Plan



Legend

East Hertfordshire District Council boundary

Reservoir Inundation Extent

- Balancing Pond C
- Bomb Pond
- Hatfield Forest Lake
- Lancaster Lake
- Shrubbs Farm Reservoir (ID395)

0 0.275 0.55 1.1 1.65 km

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APPENDIX G
FLOODING FROM RESERVOIRS

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NOTE TO FILE

JBA Project Code	2016s4502
Contract	East Hertfordshire Strategic Flood Risk Assessment
Client	East Hertfordshire District Council
Day, Date and Time	3 August 2016
Author	Sophie Dusting
Subject	East Hertfordshire SFRA Technical Appendix

1 Introduction

This document is designed to give an overview of the modelling approach for the strategic modelling used to assess fluvial flood risk to site allocations in the East Hertfordshire SFRA.

2 Modelling Approach

2.1 Introduction to hydraulic modelling

Hydraulic modelling allows simplification of very complex processes, which can enable us to predict flooding caused by events of different return periods. Hydraulic models can be classified according to the number of dimensions in which they represent the spatial domain and flow processes.

One-dimensional models can be useful for studying flood levels and discharges in river systems, and have been applied to flood routing problems at the reach scale. They allow for rapid evaluation of water levels and are best suited for describing flow within channels and through hydraulic structures. They are computationally very efficient but can be potentially expensive in terms of time and data required. The areas between cross-sections are not explicitly represented and a secondary processing step is required in order to map flood inundation.

Two-dimensional models are capable of accurately simulating flow patterns during partial inundation and drainage of the floodplain in order to predict flood risk in these regions. They are therefore best suited for describing the lateral diffusion of shallow water flows over low-lying areas. With two-dimensional models the topography and roughness is described as a continua and they facilitate direct mapping of flood inundation. However, when compared to 1D models, 2D models can be relatively computationally expensive and poor at describing flow through hydraulic structures.

Coupled 1D-2D models can therefore be used to combine the best attributes of each model class to achieve acceptable, computationally affordable predictions of flood extent when compared to typically available verification data.

2.2 SFRA modelling using JFlow

JFlow® is JBA's proprietary 2D hydraulic model. The model solves the full Shallow Water Equations on a regular square cell grid, and utilises GPU technology to provide parallelised calculations which allows large regions to be modelled efficiently, whilst capturing a wide range of flood hydraulic processes.

The Shallow Water Equations are comprised of two components. The first part is the continuity equation which describes the amount of water that moves in a given amount of time (the given amount of time is known as the timestep). The second component is the momentum equation which describes the rate at which water will move between cells. By solving both of these components at a point in time, the velocity and depth of water at a location can be determined, and by solving these sequentially through time, the passage of a flood wave over an area can be determined.

The inputs to JFlow® are a topographical domain model, which is represented as a grid where each cell of the grid represents a coordinate position with elevation data. Water is then added to the grid as either a hydrograph (river discharge vs time) or as a hyetograph (rainfall depth vs time). A number of additional parameters to the Shallow Water Equations are also input, such as Manning's n, which is a friction coefficient that accounts for losses in momentum caused by water travelling over a surface.

JFlow® determines for each cell, for each timestep in a simulation, a water depth, and a velocity. This is done in three steps. Assuming that for a cell, the water depth and the velocity of the adjacent cell is known, the first step involves determining the volume of water in the cell and the adjacent cell, and calculating the amount of water that can move between those cells (Figure 1). The second step, the inter-cell flux, determines the rate at which the amount of water calculated in step 1 can move, using the velocity of water from the previous cell and the momentum component of the shallow water equations. These two steps then allow the water depth and velocity in the cell to be calculated. Step 3 then repeats this calculation for all adjacent cells, to determine the direction, speed and volume of flow (Figure 2). This

leads to a vector calculation from the cell, in the direction of the greatest hydraulic slope calculated from each of the intercell fluxes.

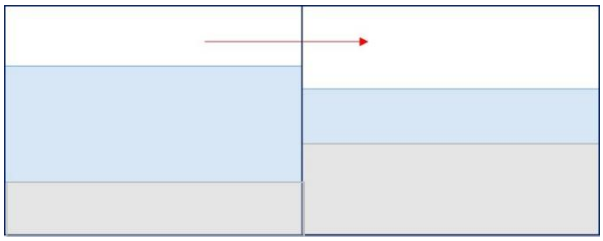


Figure 1: (Step 1 & 2) The Intercell Flux is calculated between two cells. The depth of water in each cell and the height of the terrain determines the volume of water to move. This figure will lead to a movement of water from the left side cell to the right side cell as represented by the red arrow.

The process is performed for all model cells in the domain for an interval of time (the time step), before the time interval is evolved and a new set of water depths in the grid are calculated based on the previous time interval. These steps are then repeated for the duration of the modelled flood event to determine the movement of the flood wave over the model domain.

In order to determine the greatest hazard from flooding, the maximum calculated flood depth for each cell across the time duration is calculated. The final hazard output represents a composition of the highest water depths for each cell, during the flood event. A series of model domains are used to model river reaches, before being amalgamated into a final flood hazard map.

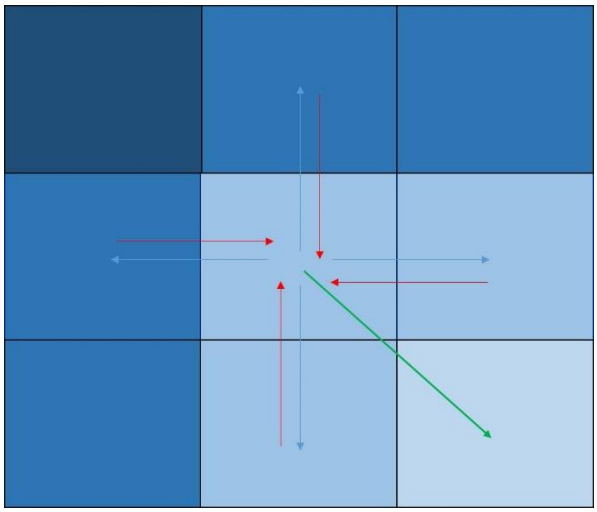


Figure 2: (Step 3) Calculating the intercell flux for all cells and solving to determine the new depth values. After step 1 and 2 are completed (red arrows), all intercell fluxes are calculated for adjacent cells and new values of depth are based on the net values of the intercell fluxes. The resulting sum in this example would see the overall flood wave propagating in the direction of the green arrow in the direction of greatest water slope

2.2.1 Hydrology

In order to run Jflow, hydrological estimates need to be generated for each inflow point. These estimates are based on catchment descriptors extracted from the FEH CD-ROM. Typically there was an inflow point upstream of each of the site allocations requiring Jflow; however, on longer stretches of watercourse multiple points were used at 100m spacing intervals. The key information within the catchment descriptors which was used to determine hydrological flows is listed in Table 1. In some cases, the

catchment descriptors associated with an inflow point can be extracted from a nearby river or stream, which may cause jumps or falls in the hydrograph values compared with the rest of the reach. In these instances, donor catchments of nearby inflow points were used with adjustments made to the catchment descriptors to represent the new characteristics.

Table 1: Example catchment descriptors

Catchment Descriptor	Explanation
Area	Drainage area km^2
DPLBAR	Mean drainage path length (km)
DPSBAR	Mean slope between nodes (m/km)
FARL	Flood attenuation due to reservoirs and lakes (1.0 for no attenuation)
SAAR	Standard annual average rainfall 1961-1990 (mm)
BFIHOST	Baseflow index from hydrology of soil types
SPRHOST	Standard percentage runoff from soil types
PROPWET	Proportion of time catchment is wet (Soil moisture deficit < 6mm)
URBEXT1990	Urban extent in 1990

Once catchment descriptors had been extracted for each inflow point a JBA tool was used to generate hydrographs for various return periods. Flood Estimation Software (JFes) provides flood estimation for catchments in UK and Ireland. JFes has the capacity to create hydrographs suitable for use in JFlow to produce river hazard maps using catchment descriptors obtained from the FEH CD-ROM as described in the previous section. JFes uses information from the HiFlows-UK dataset to search for donor sites. HiFlows-UK provides flood peak data and station information, for approximately 1,000 gauging stations in the UK. Each point extracted from FEH CD-ROM has a unique ID. The output from the bulk extraction section of JFes produces a file for each requested return period comprising hydrographs for each point with and information about peak flows. The hydrograph is suitable for use in Jflow modelling and requires minimal data manipulation.

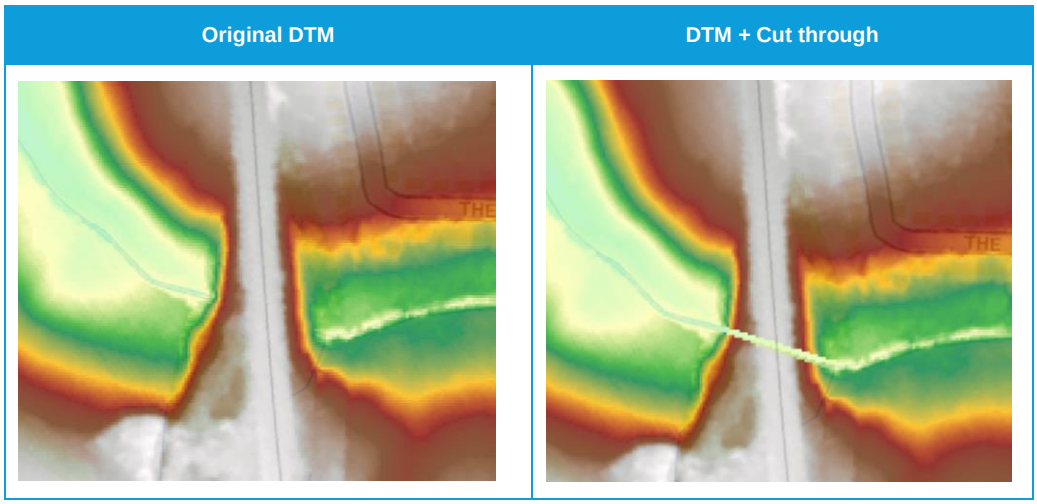
For the purpose of the SFRA the following return periods were modelled.

- 20-year defended (to inform Flood Zone 3b)
- 100-year (to inform Flood Zone 31)
- 100-year + Climate Change (+25%, +35% and +70% to account for 2080s allowances)
- 1,000-year (to inform Flood Zone 2)

2.2.2 Digital Terrain Model

The Digital Terrain Model (DTM) was created from open LIDAR downloaded from the open.gov.uk website (supplied from Environment Agency). The DTM is a bare earth model but still contains some features such as bridges, subways and embankments which appear as high ground and act as obstacles to flow during the modelling process. This can result in flow accumulating behind which can cause unrealistically high depths and wide extents. In reality, water would flow underneath or around these structures. Where unusual flood extents and depths were observed, the presence or absence of a man-made structure was confirmed by inspecting aerial imagery and the terrain model. If a structure was identified, the high elevations due to man-made obstacles were ‘cut through’ enabling more natural flow (See Figure 3).

Figure 3: DTM cut through example



2.2.3 Hydraulic Modelling Assumptions

A number of assumptions were made during the hydraulic modelling process:

- Channel capacity - This was assumed to equal QMED (2-year return period) for all rivers. Particularly in urban areas where channel improvements may have been carried out, this assumption can result in an underestimation of the channel capacity and hence an overestimation of the flood extent. However, studies have shown that unmodified river channel capacities frequently compare well with QMED and so this is deemed an appropriate assumption.
- Manning's *n* - A value of 0.1 was used throughout the study area. This represents a relatively conservative estimate but has been shown to provide acceptable model output in previous studies.
- Structures - Such as bridges and weirs were not explicitly modelled.
- Culverts - These were not explicitly modelled although smaller culverts through large structures such as railway embankments have been crudely cut into the DTM.
- Undefended - All river modelling is undertaken as undefended.

2.2.4 Outputs

Upon running Jflow, the following outputs were produced for each inflow point:

- Maximum depth
- Maximum velocity
- Maximum hazard

Following completion of the modelling, all outputs from each inflow point were mosaicked into one dataset per return period.

2.2.5 Quality Control

Once the hydraulic model was run for each return period, the resulting depth grid outputs were visually checked and adjustments to the modelling inputs were made where required. The adjustments and checks made include (but are not limited to):

- **Straight edges** – In some cases, straight edges can occur in the flood outlines where the flow is artificially restricted by the modelling domain size. The domain was extended to allow flow to run out naturally where possible.
- **Disconnected flooding** – Flood outlines can be disconnected as a result of a high point in the DTM that restricts the flow. This can be improved by moving an inflow point to the high point in an attempt to fill the break in the flood outline. In some cases, where the channel is not well represented, manual editing of the channel can occur. In all cases the channel was considered with reference to aerial imagery.
- **Cross section edges** - Due to the modelling methods used, straight edges of relatively deeper depths can occur where inflow points are located across the flood outline. This is especially prominent where flow can become constricted behind a road or railway line. To mitigate this, the inflow point was moved upstream further away from the restriction or the cross sections re-angled appropriately.
- **Alignment of points** – Due to the nature of the watercourses and the resolution of the LIDAR creation of inflow points, in some cases these were located outside of the river channel causing unrealistic flood outlines. These points were moved onto the lowest part of the river channel to correct this problem.
- **Restriction of flow due to structures** – The flood depths can be artificially increased by the presence of blockages in the DTM, these can be mitigated by DTM editing (as explained in section 2.1.2)
- **Increase in depth/extent per return** – both visual and automatic checks are undertaken to ensure that flood depths and flood extents increase with return period.
- **Unrealistic output** – in certain circumstances, JFlow can produce erroneous output where flood depths and extents are unrealistically produce. These errors were spotted both visually and through automatic checks.

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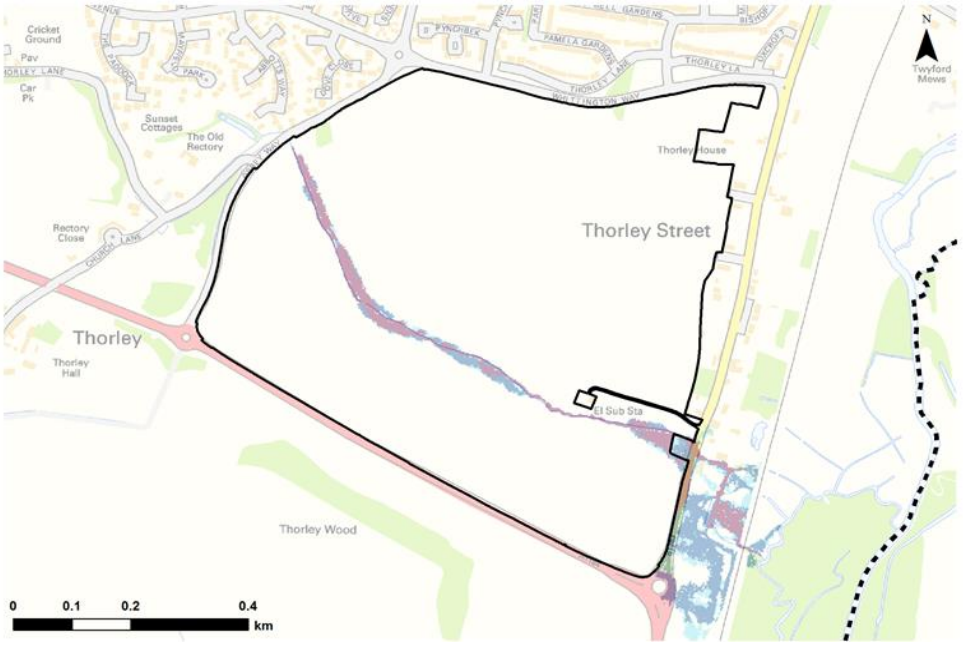
EH1 - BISH7, Bishops Stortford, South, + Employment Land					
OSNGR: 548480,218967	Area: 54.30ha		Greenfield		
Flood Zone Coverage: *based on 2D Jflow modelling	**FZ3b** 2.03%*	**FZ3a** 2.85%*	**FZ2** 3.13%*	**FZ1** 91.99%*	
Proposed Development Details: 750 homes, primary and secondary education, 4-5 hectares of employment land and green space					
Exception Test Required? Likely, as the flood risk from the unnamed watercourse intersects the site which may constrain where development can be placed. The Exception test is needed if: "More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2. "Essential Infrastructure" development in FZ3b will also require the Exception Test. "Highly Vulnerable" development should not be permitted within FZ3a and FZ3b. "More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b					
NPPF Guidance: • For development proposals on sites comprising one hectare or above in Flood Zone 1, the vulnerability of flooding from other sources as well as from river flooding should be considered in a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.					
Sources of Flood Risk: The primary flood risk to the potential development site is fluvial from the unnamed drain which flows through the centre of the site. Water is mainly confined to the channel and areas immediately adjacent, flood hazard is mainly classed as very low outside of these areas. Factoring in climate change at 25%, 30% and 70% does not significantly affect the area at risk of fluvial flooding. Parts of the site are also shown to be affected by surface water flooding; these areas tend to correspond with the watercourse but also pockets form in the north east.					

Flood Zone Map



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This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map



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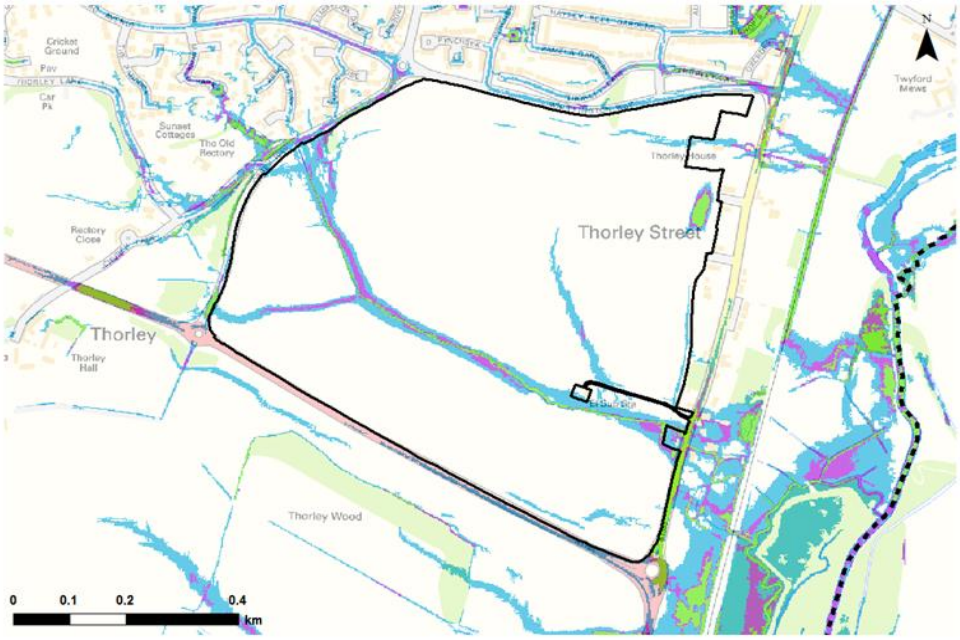
Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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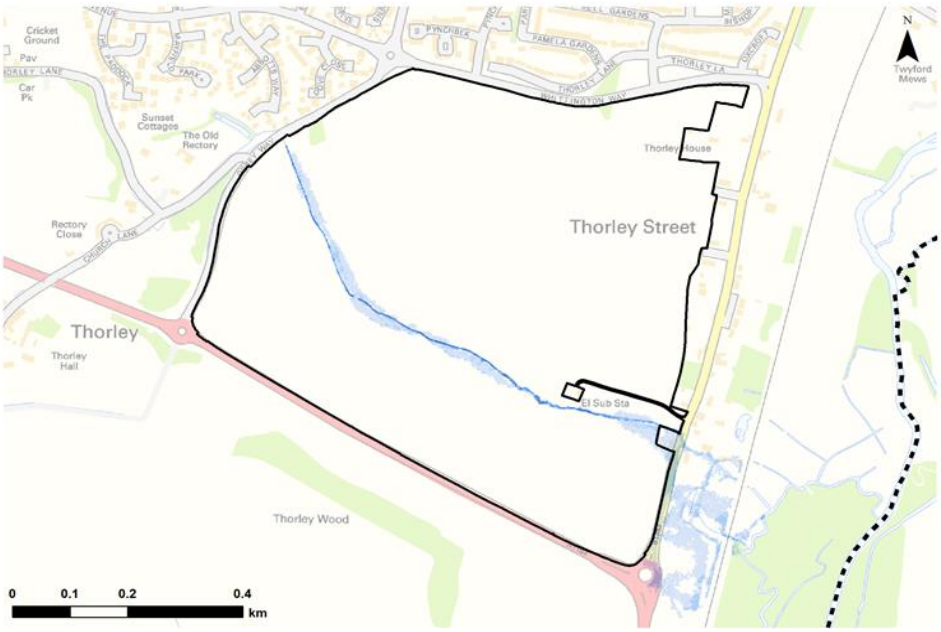
Potential Site Allocations
uFMfSW* 30-year Extent
uFMfSW* 1,000-year Extent
Council boundary
uFMfSW* 100-year Extent

Depth Map



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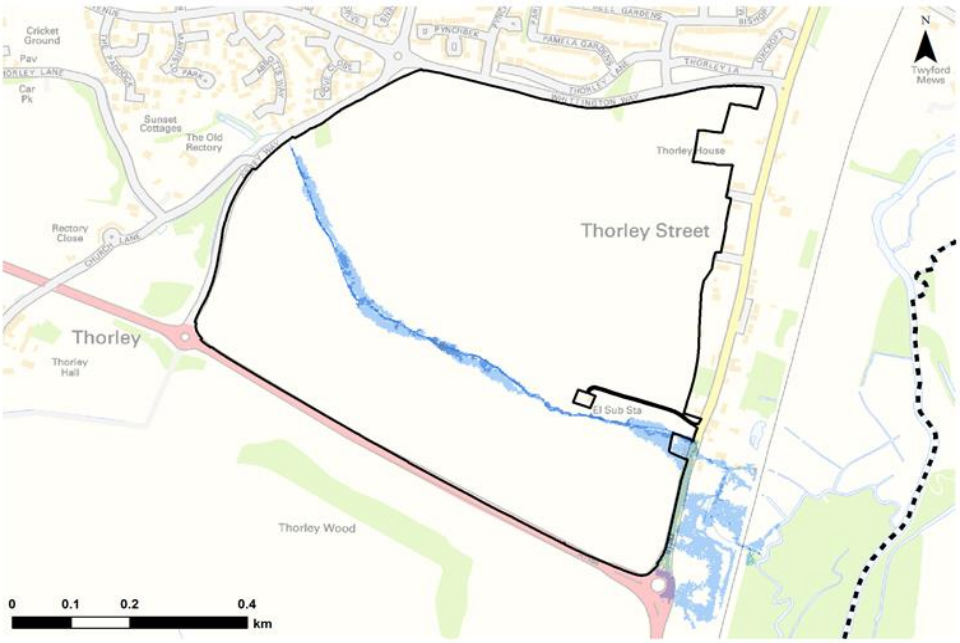
This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10
0.10 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
2.00 - 2.50
2.50 - 3.00
3.00 - 3.50
3.50 - 4.00
>4.00

Velocity Map



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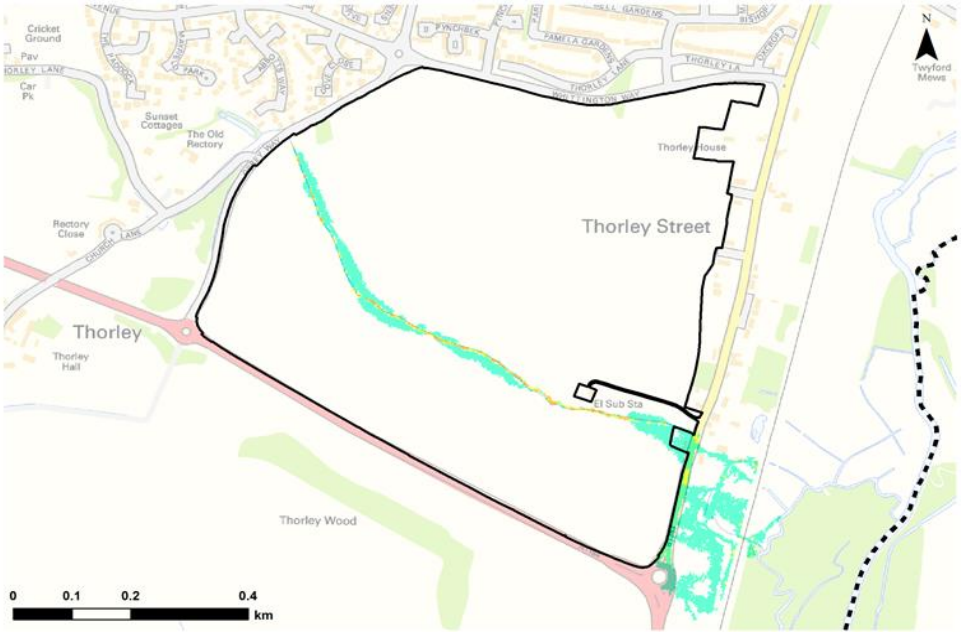
This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2
0.2 - 0.5
0.5 - 1.0
1.0 - 2.0
> 2.0

Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most source control techniques are likely to be suitable.
Infiltration		Infiltration may be suitable. Mapping suggests a medium risk of groundwater flooding and underlying soils may be permeable. Further site investigation should be carried out to assess potential for drainage by infiltration. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m. Additionally, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints given that the site is located with a Source Protection Zone.
Detention		This option may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has groundwater issues, a liner may be required.
Filtration		This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has groundwater issues, a liner will be required.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has groundwater issues, a liner will be required.

The site is not designated by the Environment Agency as previously being a landfill site.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences:
There are no flood defences at this site.

Flood Warning:
There are currently no flood warning areas or flood alerts covering this site.

Access & Egress:
Access and egress to the site can be achieved via a number of roads around the majority of the site boundary. Many of these routes are impacted by surface water, with the B1383 impacted by fluvial flooding, shown in Flood Zone3b of the indicative Flood Zones. Consideration should be given to the safest route to and from the site in times of flood to ensure safe access and egress can be achieved at all times. Fluvial flood risk divides the site into two; it is important that development on both sides of the watercourse have safe access and egress in times of flooding.

Climate Change:
Climate change mapping indicates the following impacts for the future:
• Increased storm intensities.
• The increase in Flood Zone 3a outline with differing climate change allowances is minimal
• The floodplain of the unnamed drain appears to be fairly constrained within this area; with the 70% climate change allowance being similar to Flood Zone 2. It may, however, increase the depth, velocity and hazard of flooding in the area affected.
• Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

•Use of the Sequential approach to development means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
• Access and egress routes are at risk from both fluvial and surface water flooding; in order to pass the Exception Test, development will need to ensure that safe access and agress can be provided for the lifetime of the development.
• Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access/ egress routes
•Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development.
• The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.
• The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk in the urban areas downstream; development should consider the feasibility of including any green corridors or strategic flood risk solutions, depending on the land available.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.
• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
• The peak flows of the unnamed watercourse should be considered when considering drainage.
• Resilience measures will be required if buildings are situated in the flood risk area.
• Safe access and egress will need to be demonstrated; currently some access and egress routes are affected by surface water flooding and fluvial flooding from a 20-year event.
• Assessment for surface water runoff should include allowance for climate change effects.
• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
    - o Reducing volume and rate of runoff
    - o Relocating development to zones with lower flood risk
    - o Creating space for flooding.
    - o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.
• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
• Developers may need to undertake more detailed hydraulic modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

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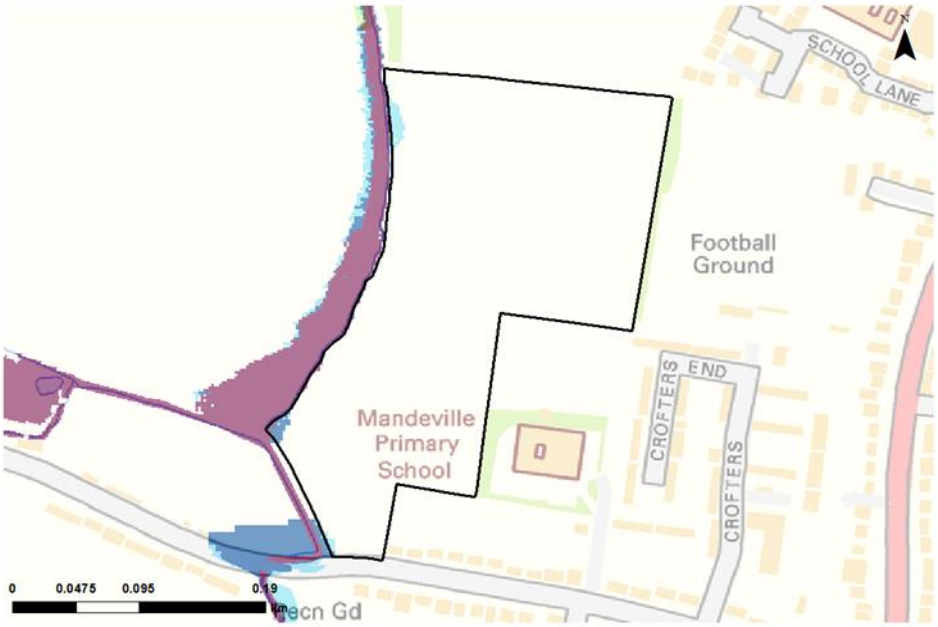
EH2 - SAWB2, Sawbridgeworth West: North West Road					
OSNGR: 547887,215500	Area: 5.91ha		Greenfield		
Flood Zone Coverage: *based on 2D Jflow modelling	**FZ3b** 0.44%*	**FZ3a** 0.79%*	**FZ2** 1.59%*	**FZ1** 97.18%*	
Proposed Development Details: 125 homes, expansion of existing primary school and green space					
Exception Test Required? Unlikely, as the majority of the site is located within Flood Zone 1. Less than 1% of the site is located in the Flood Zones. The Exception Test is required if: "More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2. "Essential Infrastructure" development in FZ3b will also require the Exception Test. "Highly Vulnerable" development should not be permitted within FZ3a and FZ3b. "More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b					
NPPF Guidance: • For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.					
Sources of Flood Risk: A very small area of the site is at risk of fluvial flooding from two unnamed watercourses located just outside of the southern and western site boundaries. The vast majority of the site is on higher ground located in Flood Zone 1 and therefore is at little risk of fluvial flooding. Factoring in climate change allowances does not significantly affect the area at risk of fluvial flooding. The site is at limited risk of surface water flooding adjacent to the unnamed watercourse along the western site boundary.					

Flood Zone Map



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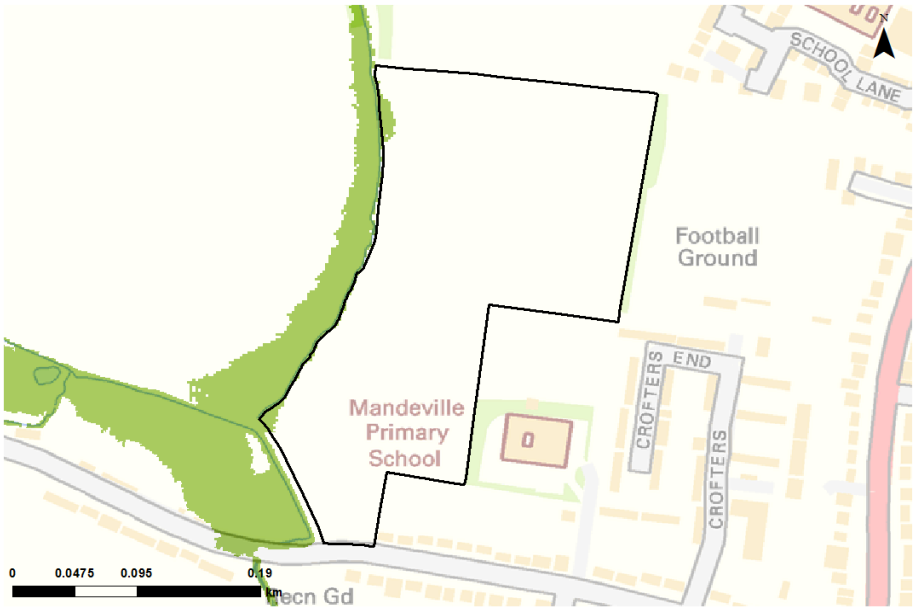
The Flood Zones in this map are derived from two different sources of data. The drain along the site's western boundary is represented by 2D generalised modelling using Jflow software, to obtain indicative flood extents where a drain was shown on OS mapping. The extent for the unnamed watercourse along the site's southern boundary is derived from existing model results from the Stort Tributaries modelling (Sawbridgeworth Brook). They use the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.
The Jflow extent has been trimmed to where it meets the Sawbridgeworth Brook so that detailed modelling takes precedence, though the flood extent at the confluence may therefore be conservative.
Developers may need to consider undertaking more detailed hydraulic modelling of the western boundary drain as part of a site-specific FRA.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map



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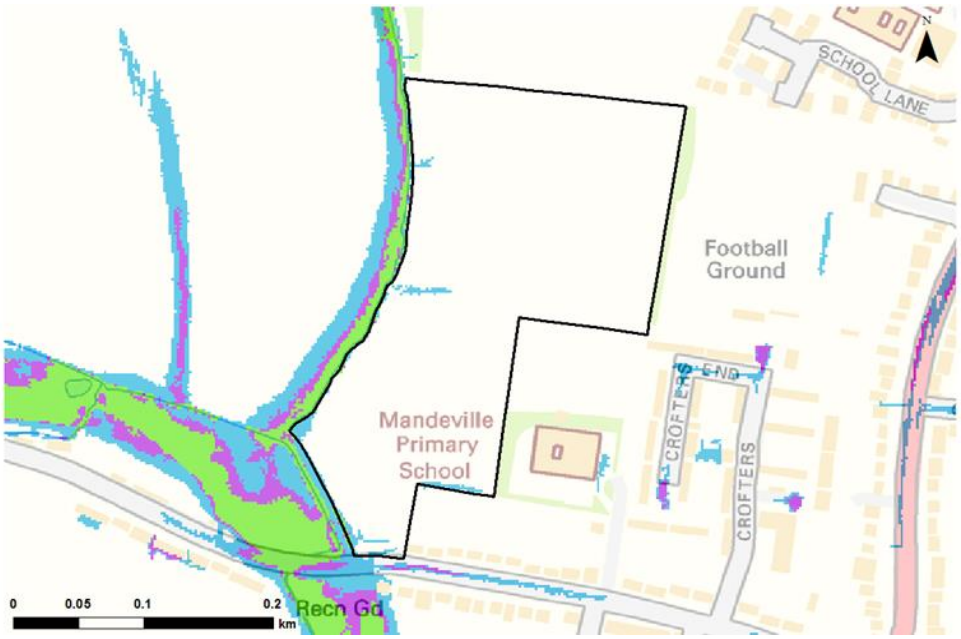
This climate change map is a combined output from Jflow 2D generalised modelling for the western drain, and existing Stort Tributaries modelling (Sawbridgeworth Brook) for the southern drain. Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%. The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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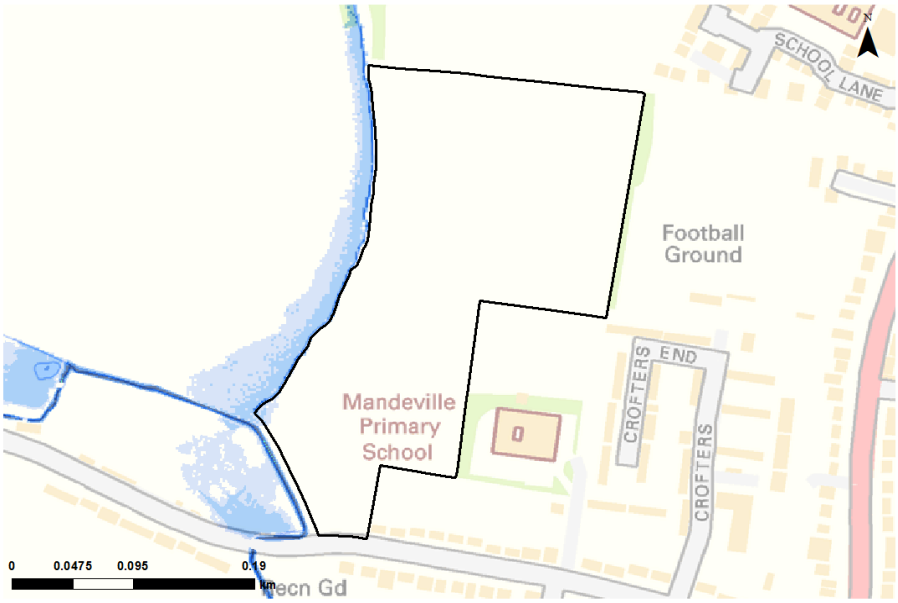
Potential Site Allocations
Council boundary
uFMfSW* 30-year Extent
uFMfSW* 100-year Extent
uFMfSW* 1,000-year Extent

Depth Map



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This depth map is a combined output from Jflow 2D generalised modelling for the western drain, and existing Stort Tributaries modelling (Sawbridgeworth Brook) for the southern drain, and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10	0.10 - 0.50	0.50 - 1.00	1.00 - 1.50
1.50 - 2.00	2.00 - 2.50	2.50 - 3.00	3.00 - 3.50
3.50 - 4.00	>4.00		

Velocity Map



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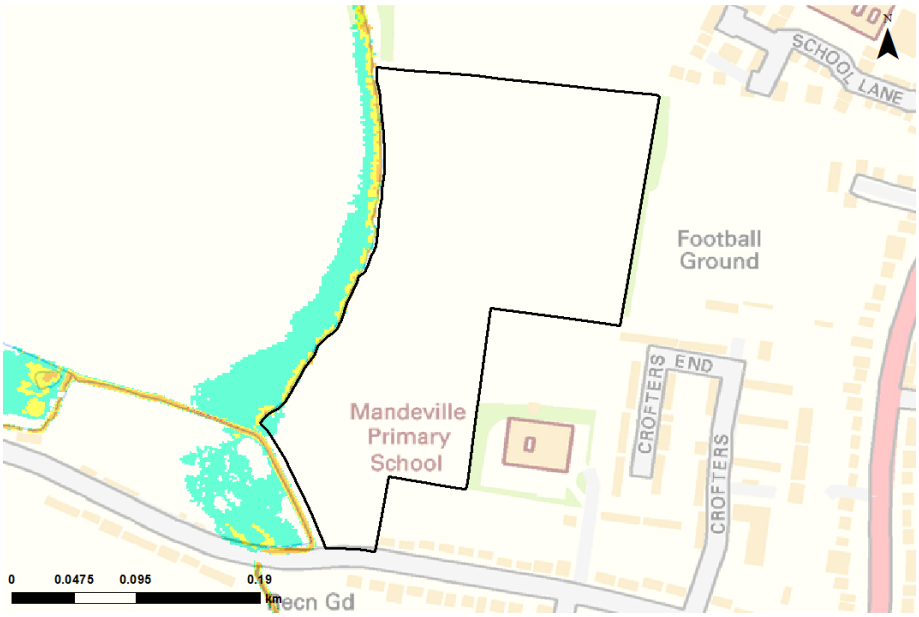
This velocity map is a combined output from Jflow 2D generalised modelling for the western drain, and existing Stort Tributaries modelling (Sawbridgeworth Brook) for the southern drain, and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0
> 2.0			

Hazard Map



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This hazard map is a combined output from Jflow 2D generalised modelling for the western drain, and existing Stort Tributaries modelling (Sawbridgeworth Brook) for the southern drain, and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most forms of source control are likely to be suitable.
Infiltration		Mapping suggests medium permeability at the site consequently infiltration is likely to be suitable. A site investigations should be carried out to assess potential for drainage by infiltration. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m.
Detention		Mapping suggests that the site slopes are suitable for all forms of detention. A liner maybe required to prevent the egress of groundwater.
Filtration		All filtration techniques are likely to be suitable. A liner maybe required to prevent the egress of groundwater.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. A liner maybe required to prevent the egress of groundwater.

The site is not designated by the Environment Agency as previously being a landfill site.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences: There are no flood defences at this site.
Flood Warning: This site is partly covered by 'The River Lee at Hertford and Ware including Stanstead Abbotts' Flood warning Area, and partly covered by 'The River Lee at Hertford including Lemsford, Hatfield, Ware and Stanstead Abbotts' Flood Alert Area (062WAF46MidLee).
Access & Egress: Access to and egress from the site is possible via West Road. The possibility for access and egress may be limited in the event of fluvial flooding with much of the road affected by surface water flooding and sections are located within Flood Zone 3a. Consideration is needed to how safe access and egress can be achieved in times of flood.
Climate Change: Climate change mapping indicates the following impacts for the future: • Increased storm intensities. • The increase in Flood Zone 3a outline with differing climate change allowances is minimal at the site boundary. • Climate change may also increase the extent, depth and frequency of surface water flooding.
Implications for Development: •Use of the Sequential approach to development means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped. • Access and egress routes are at risk from both fluvial and surface water flooding; in order to pass the Exception Test, development will need to ensure that safe access and agress can be provided for the lifetime of the development. • Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access/ egress routes • The site is partially covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to the Flood Warning Service would not be required. • The site is not known to benefit from any flood defences. Given the size and location of the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment. This could be investigated further at site-specific level.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.
• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
• The peak flows of the unnamed watercourse should be considered when considering drainage.
• Resilience measures will be required if buildings are situated in the flood risk area.
• Safe access and egress will need to be demonstrated; currently some access and egress routes are affected by surface water flooding and fluvial flooding from a 100-year event.
• Assessment for runoff should include allowance for climate change effects.
• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
    o Reducing volume and rate of runoff
    o Relocating development to zones with lower flood risk
    o Creating space for flooding.
    o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.
• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
• Developers may need to undertake more detailed hydraulic modelling of the unnamed watercourse along the western boundary to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH3 - HERT2, Hertford, Mead Lane North				
OSNGR: 533258,213225	Area: 4.19ha		Brownfield	
Flood Zone Coverage:	**FZ3b** 0.5%	**FZ3a** 8%	**FZ2** 27%	**FZ1** 64.5%

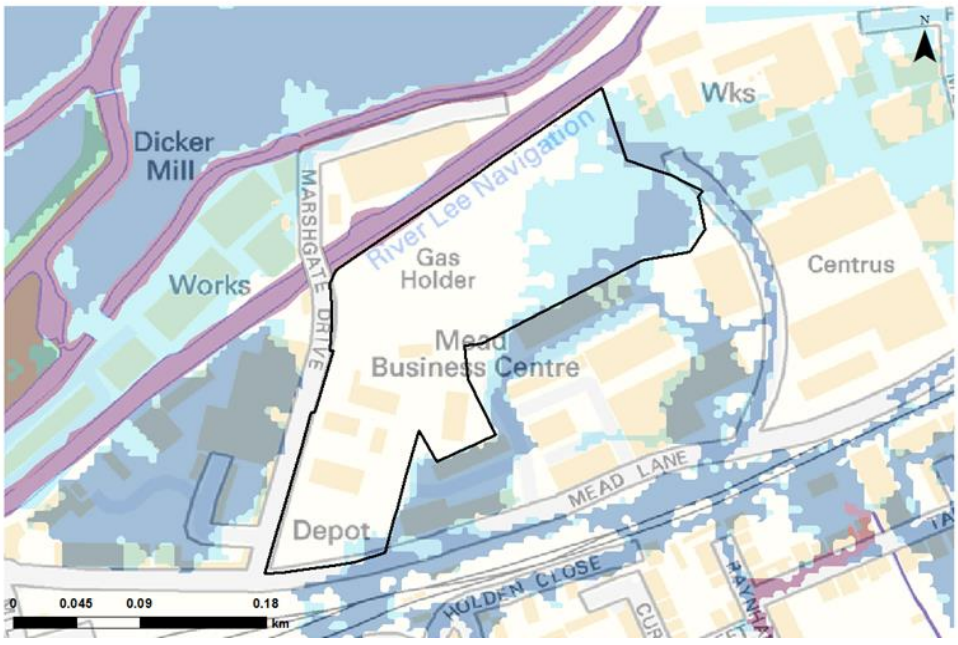
Proposed Development Details:
193 homes and employment land

Exception Test Required?
Yes, if "More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.

NPPF Guidance:
• For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
• The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new developmenton surface water run-off should be considered.
• Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:
The site is bounded by the River Lee Navigation to the north. In addition, there are two drains situated to the south of the site; The Gulphs and Rowleys Road Drain. Fluvial flooding from these drains means almost 30% of the site is within Flood Zone 2 and a smaller proportion in Flood Zone 3; the areas affected being in the eastern corner of the site. Extensive surface water flooding is shown to occur in the eastern half of the site.

Flood Zone Map



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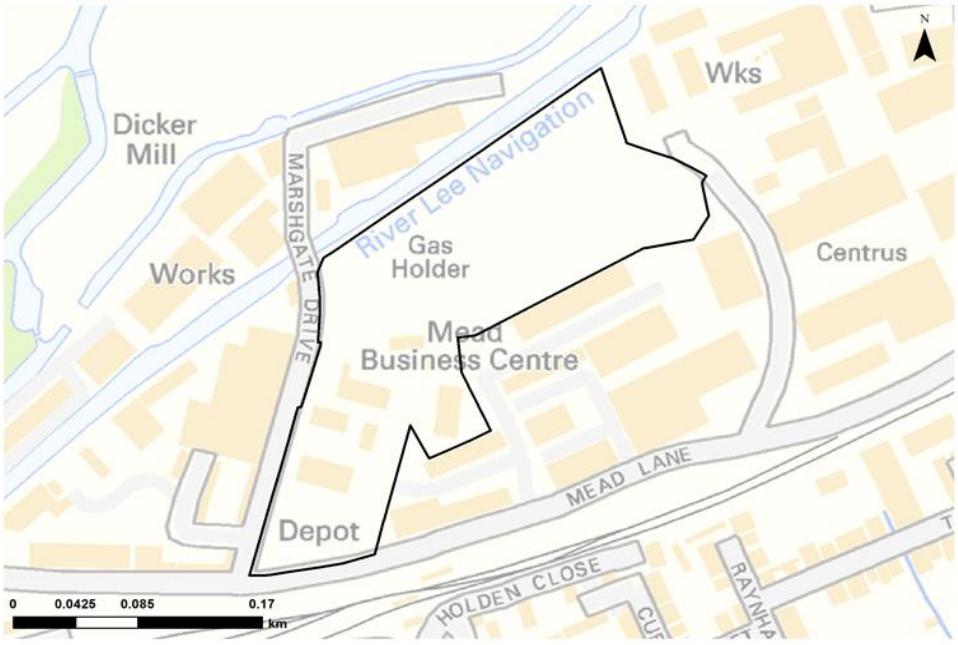
The Flood Zone maps above are derived from the existing Environment Agency hydraulic model of the River Lee, using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map - to be updated when modelling completed

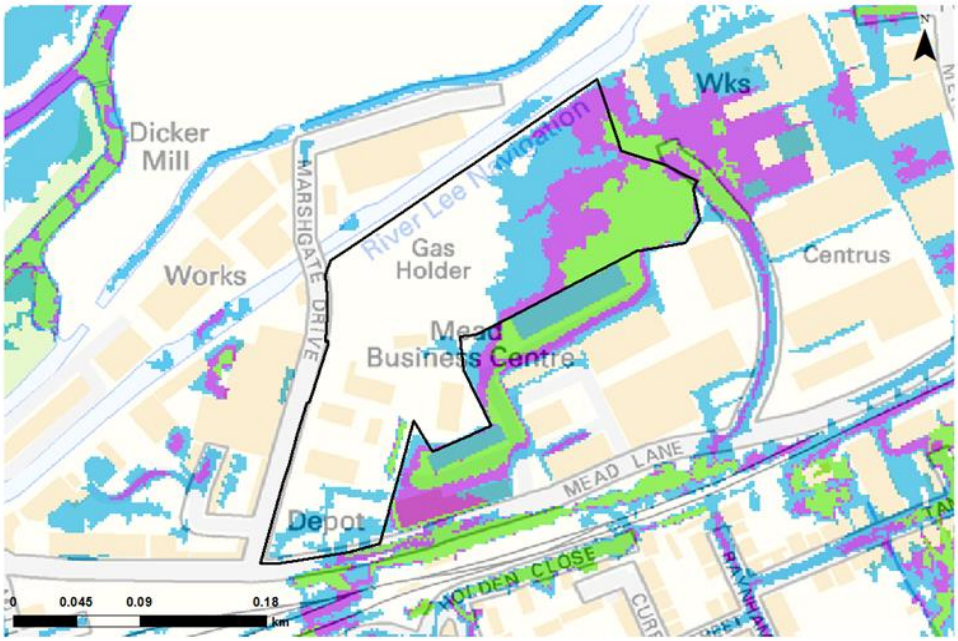


Contains Ordnance Survey data. © Crown copyright and database rights 2016

Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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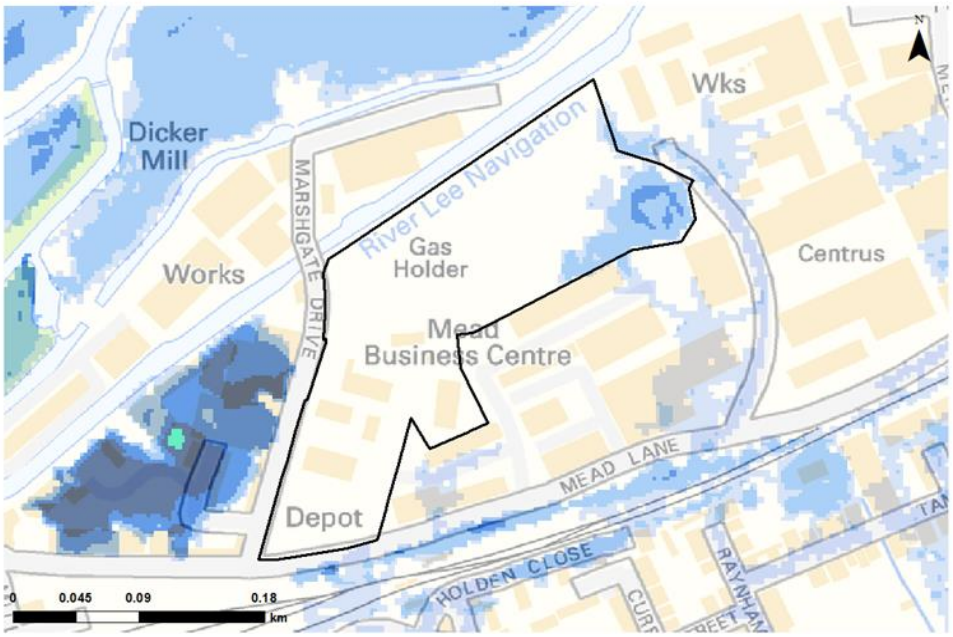
Potential Site Allocations
Council boundary
uFMfSW* 30-year Extent
uFMfSW* 100-year Extent
uFMfSW* 1,000-year Extent

Depth Map



Contains Ordnance Survey data. © Crown copyright and database rights 2016

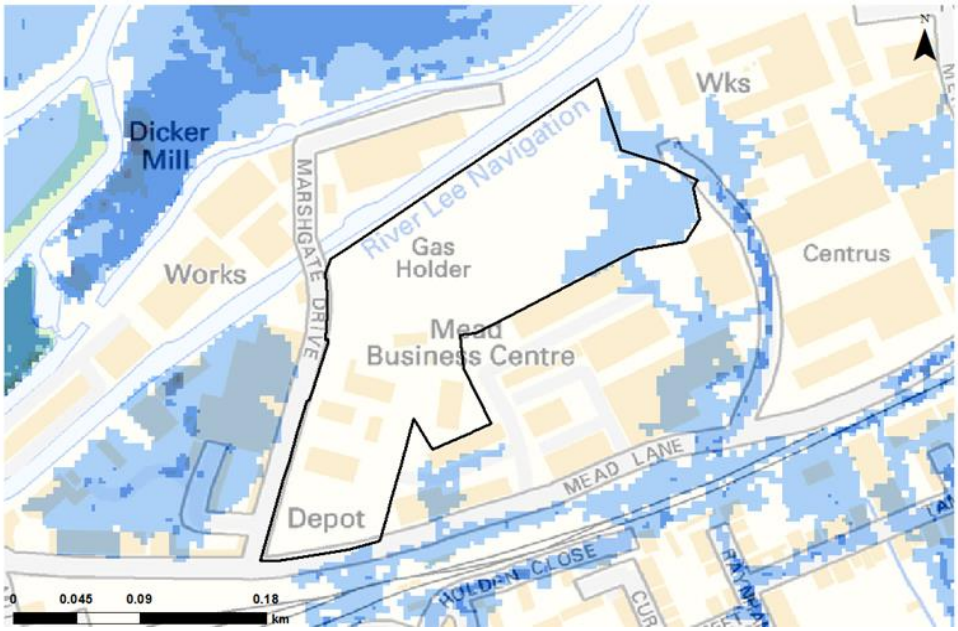
This depth map is derived from the existing Environment Agency River Lee modelling and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10	0.10 - 0.50	0.50 - 1.00	1.00 - 1.50
1.50 - 2.00	2.00 - 2.50	2.50 - 3.00	3.00 - 3.50
3.50 - 4.00	>4.00		

Velocity Map



Contains Ordnance Survey data. © Crown copyright and database rights 2016

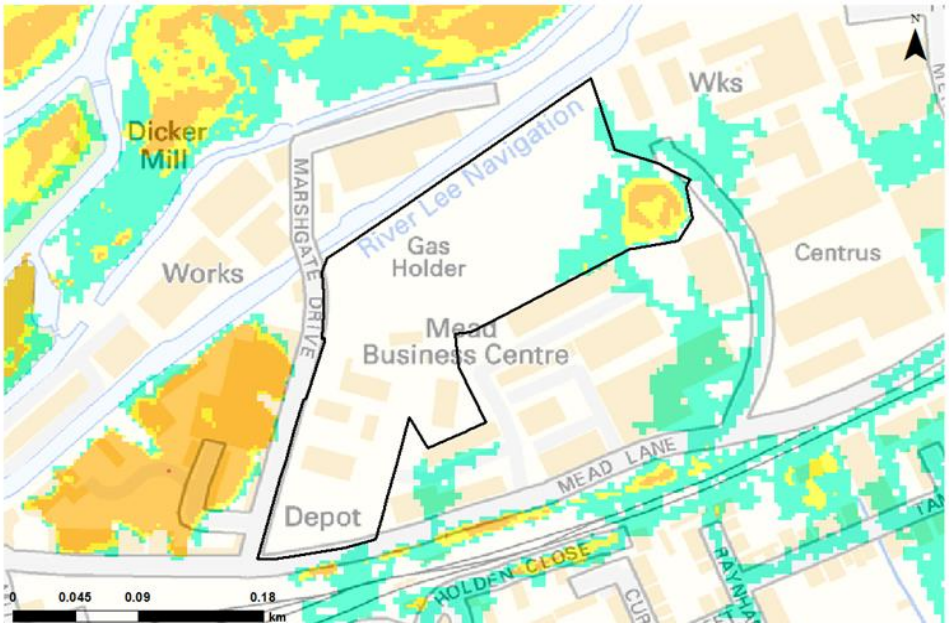
This velocity map is derived from the existing Environment Agency River Lee modelling and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0
> 2.0			

Hazard Map



Contains Ordnance Survey data. © Crown copyright and database rights 2016

This hazard map is derived from the existing Environment Agency River Lee modelling and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most source control techniques are likely to be suitable.
Infiltration		Mapping suggests that there is a high risk of groundwater flooding at this location, therefore it is likely infiltration techniques will not be suitable. This should be confirmed via site investigations to assess the potential for infiltration. If possible, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints given that the site is located within a Source Protection Zone.
Detention		This should be investigated with more detailed site specific data as this option may be feasible provided slopes are <5% at the location of the detention feature. A liner maybe required to prevent the egress of groundwater and if there are any contamination issues with the site being brownfield.
Filtration		This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination or groundwater issues, a liner will be required

The site is not designated by the Environment Agency as previously being a landfill site.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences:

The site is not formally defended; however, there is a flood defence present on the opposite bank (right hand bank).

Flood Warning:

This site is not covered by a Flood Warning Area; however, it is partly covered by the River Stort and Stansted Brook Catchment Flood Alert Area (062WAF51Stort).

Access & Egress:

Primary access and egress to the site is via Mead Lane and Marshgate Drive. Mead Lane is shown to be affected by Flood zone 3b and in the 100-year surface water event. Alternatively Marshgate Drive is shown to be largely unaffected by both surface water and fluvial flooding.

Climate Change:

Climate change mapping indicates the following impacts for the future:
• Increased storm intensities.
• Increased water extent, depth, velocity and hazard in the watercourse.
• Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

•Use of the Sequential approach to development means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
• Any 'Highly Vulnerable' development placed within Flood Zone 2 will be required to pass the Exception Test.
• Safe access and egress is not considered an issue along Marshgate Drive, although climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes.
• Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes
• Broadscale assessment of suitable SuDS has indicated a number of different types may be possible, though infiltration may be unlikely due to groundwater constraints; this should be investigated further at site-specific level. Given the size of the site and the proportion of the site at risk from flooding, the type of SuDS system used may be influenced by amount of land available.
• The site is partially covered by the Environment Agency's Flood Warning Service (Flood Alert).
• The site is not known to benefit from any flood defences. Given the size and location of the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment given the land requirement that any strategic storage solution would require.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.
• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
• The peak flows of the unnamed watercourse should be considered when considering drainage.
• Resilience measures will be required if buildings are situated in the flood risk area.
• Safe access and egress will need to be demonstrated; currently some access and egress routes are affected by surface water flooding and fluvial flooding from a 100-year event but alternate route are available.
• Assessment for runoff should include allowance for climate change effects.
• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
    o Reducing volume and rate of runoff
    o Relocating development to zones with lower flood risk
    o Creating space for flooding.
    o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.
• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

EH4 - HERT5, Hertford, South					
OSNGR: 533037,211884	Area: 4.89ha		Greenfield		
Flood Zone Coverage: *based on 2D Jflow modelling	**FZ3b** 2.56%*	**FZ3a** 3.04%*	**FZ2** 3.76%*	**FZ1** 90.64%*	
Proposed Development Details: 50 homes and green space on western portion of site					
Exception Test Required? Unlikely, as the majority of the site is on higher ground and located in Flood Zone 1. The Exception Test is needed if: "More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2. "Essential Infrastructure" development in FZ3b will also require the Exception Test. "Highly Vulnerable" development should not be permitted within FZ3a and FZ3b. "More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b					
NPPF Guidance: • For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.					
Sources of Flood Risk: The vast majority of the site is located within Flood Zone 1 and is considered to be at low risk of fluvial flooding. Fluvial risk is located along the western boundary from a unnamed drain. Factoring in climate change at 25%, 30% and 70% does not result in significantly more of the site being affected by fluvial flooding. Surface water flooding is shown to generally affect the western boundary of the site, in line with topographic flow routes.					

Flood Zone Map



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This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map



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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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Potential Site Allocations
uFMfSW* 30-year Extent
uFMfSW* 1,000-year Extent
Council boundary
uFMfSW* 100-year Extent

Depth Map



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This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10
0.10 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
2.00 - 2.50
2.50 - 3.00
3.00 - 3.50
3.50 - 4.00
>4.00

Velocity Map



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This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2
0.2 - 0.5
0.5 - 1.0
1.0 - 2.0
> 2.0

Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Infiltration likely to be suitable. Mapping suggests a low risk of ground water flooding however, site investigations should be carried out to assess potential for drainage by infiltration.
Detention		Mapping suggests that the site slopes are suitable for all forms of detention.
Filtration		All filtration techniques are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination issues, a liner will be required.

The site is not designated by the Environment Agency as previously being a landfill site.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences:
There are no flood defences at this site.

Flood Warning:
There are currently no flood warning areas or flood alerts covering this site.

Access & Egress:

The main access and egress routes to the site appear to be via Mangrove Road and Mangrove Drive; neither of these routes are significantly affected by fluvial or surface water.

Climate Change:

Climate change mapping indicates the following impacts for the future:
• Increased storm intensities.
• The increase in Flood Zone 3a outline with differing climate change allowances is minimal within the site boundary.
• The floodplain of the unnamed drain appears to be fairly constrained within this area; with 70% climate change allowance the flood outline is similar to Flood Zone 2. It may, however, increase the depth, velocity and hazard of flooding in the area affected.
• Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:
• Use of the Sequential Approach means, given the size of the site, development can be placed away from the Flood Zones, with the small area affected by the Flood Zones left undeveloped.
• Safe access and egress is not an issue for this site
• Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes
• Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development.
• The site is not known to benefit from any flood defences. Given the size and location of the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment, though green corridors along the watercourse should be encouraged.

Guidance for Developers:
• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.
• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
• The peak flows of the unnamed watercourse should be considered when considering drainage.
• Resilience measures will be required if buildings are situated in the flood risk area.
• Assessment for runoff should include allowance for climate change effects.
• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
  - o Reducing volume and rate of runoff
  - o Relocating development to zones with lower flood risk
  - o Creating space for flooding.
  - o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.
• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.
• Developers may need to undertake more detailed hydraulic modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

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EH5 - BISH3, Bishops Stortford, The Goods Yard				
OSNGR: 549168,220788	Area: 6.66ha		Green & Brownfield (40/60)	
Flood Zone Coverage:	**FZ3b** 0.3%	**FZ3a** 0.3%	**FZ2** 38%	**FZ1** 61.4%

Proposed Development Details:
400 homes, employment and retail

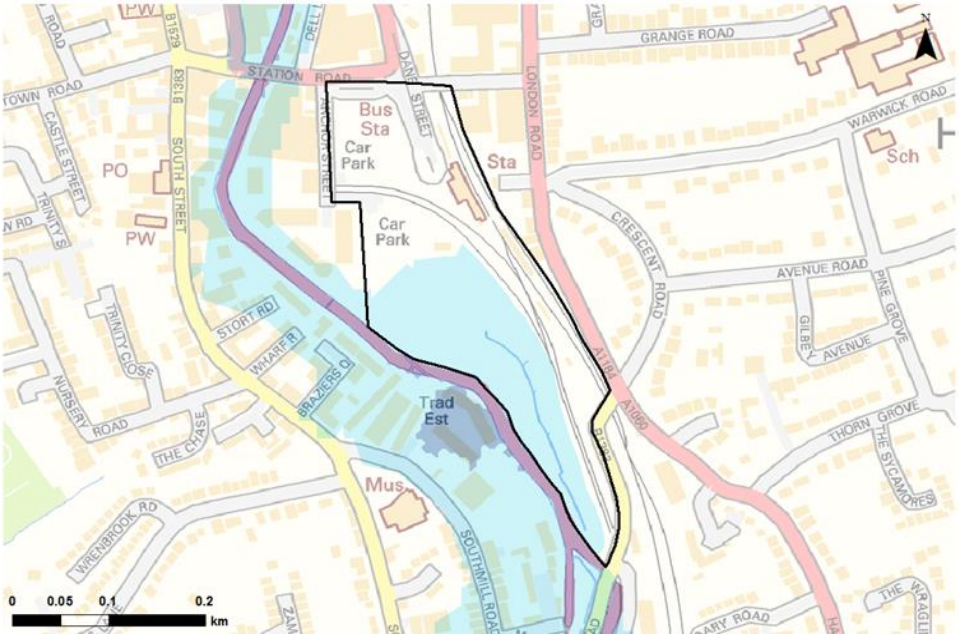
Exception Test Required?
Yes, if 'Highly Vulnerable' development is located in FZ2.

NPPF Guidance:
• For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
• The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new developmenton surface water run-off should be considered.
• Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond thrugh the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:

The site is bounded by the River Sort (Navigation) and spilt to the south by an unamed watercourse. Approximately two-thirds of the site is located within Flood Zone 1 and is considered at very low risk of fluvial flooding. The fluvial risk is located to the south-west of the site in Flood Zone 2. Surface water flooding is shown as a flow path along the railway lines and the unnamed watercourse.

Flood Zone Map



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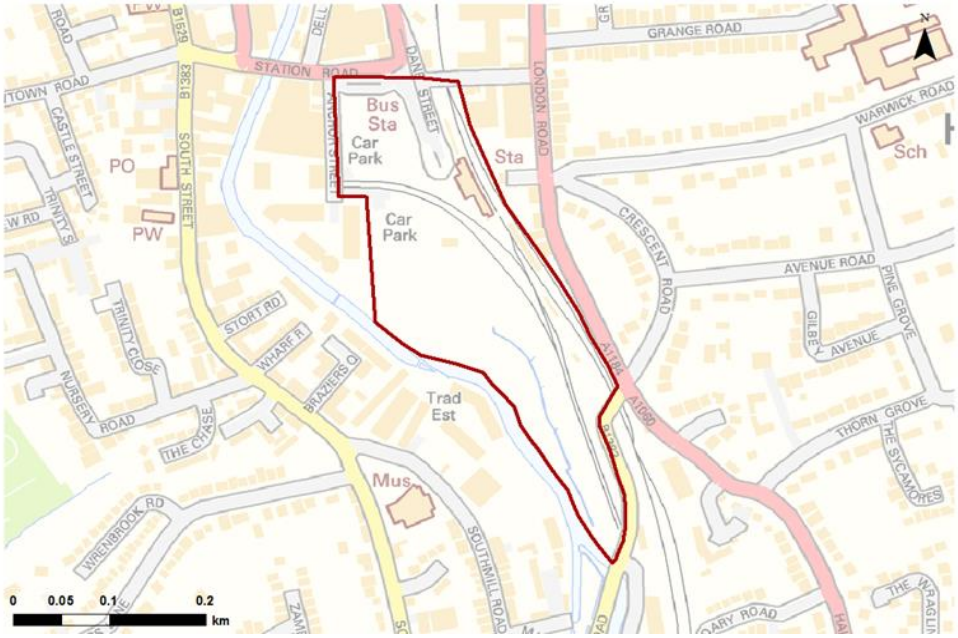
The Flood Zone maps above are derived from the existing Environment Agency hydraulic model of the River Stort, using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map - to be updated when modelling completed

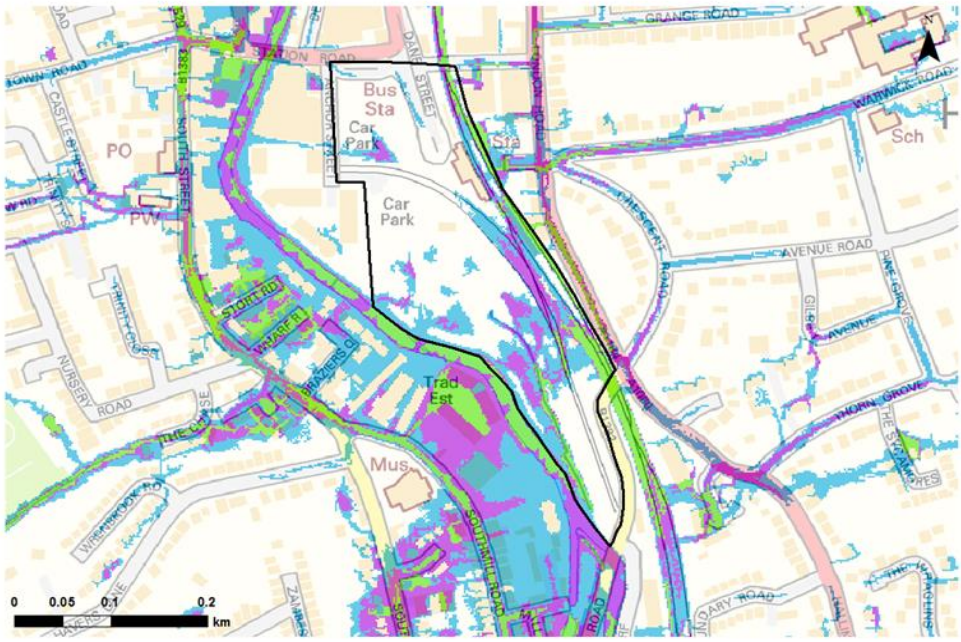


Contains Ordnance Survey data. © Crown copyright and database rights 2016

Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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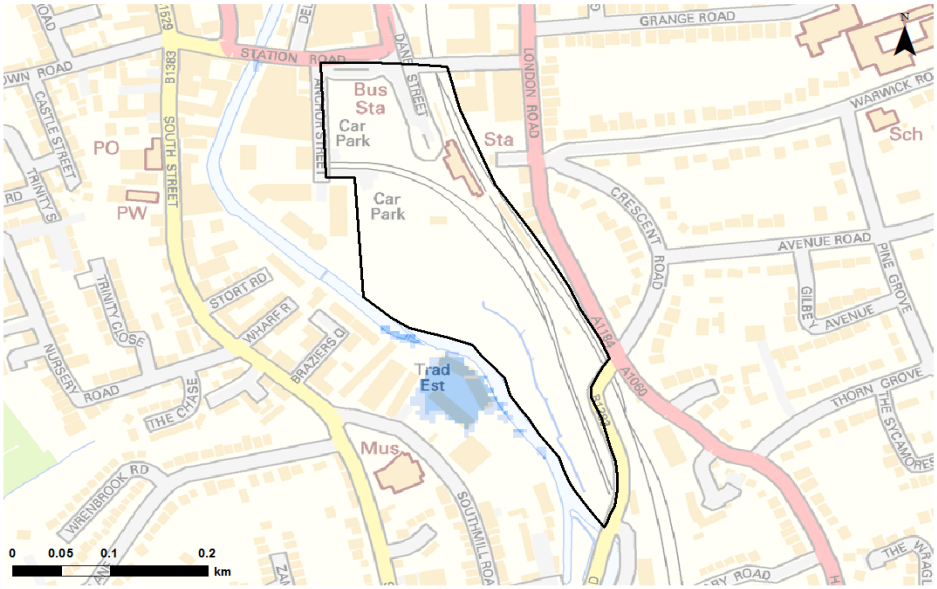
Potential Site Allocations
Council boundary
uFMfSW* 30-year Extent
uFMfSW* 100-year Extent
uFMfSW* 1,000-year Extent

Depth Map



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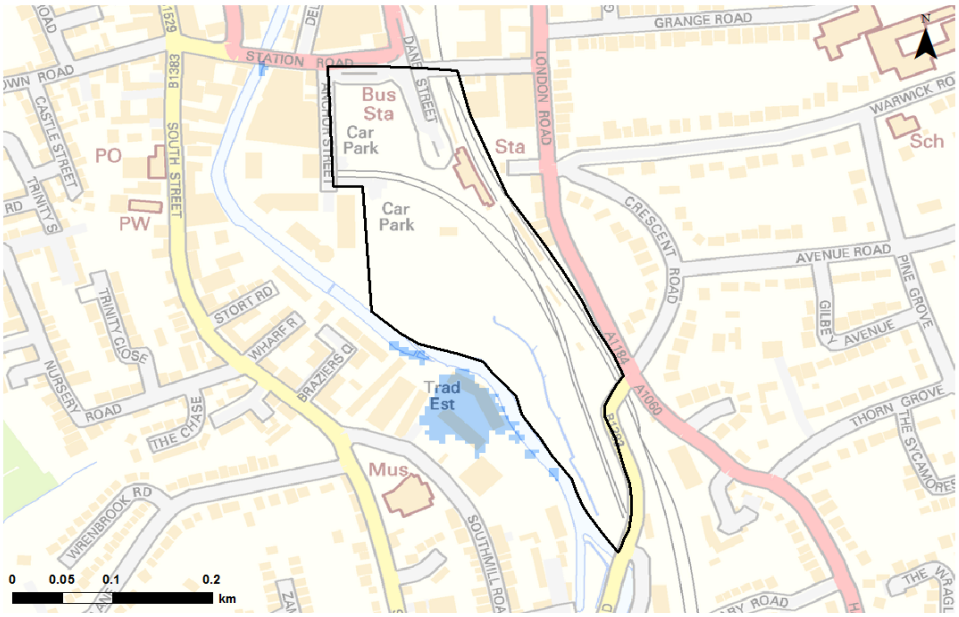
This depth map shows only a visual representation of the river channel as hydraulic model results show water remains in-bank during the 100-year event, and therefore no depth map of the channel is available.

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10	0.10 - 0.50	0.50 - 1.00
1.00 - 1.50	1.50 - 2.00	2.00 - 2.50
2.50 - 3.00	3.00 - 3.50	3.50 - 4.00
>4.00		

Velocity Map



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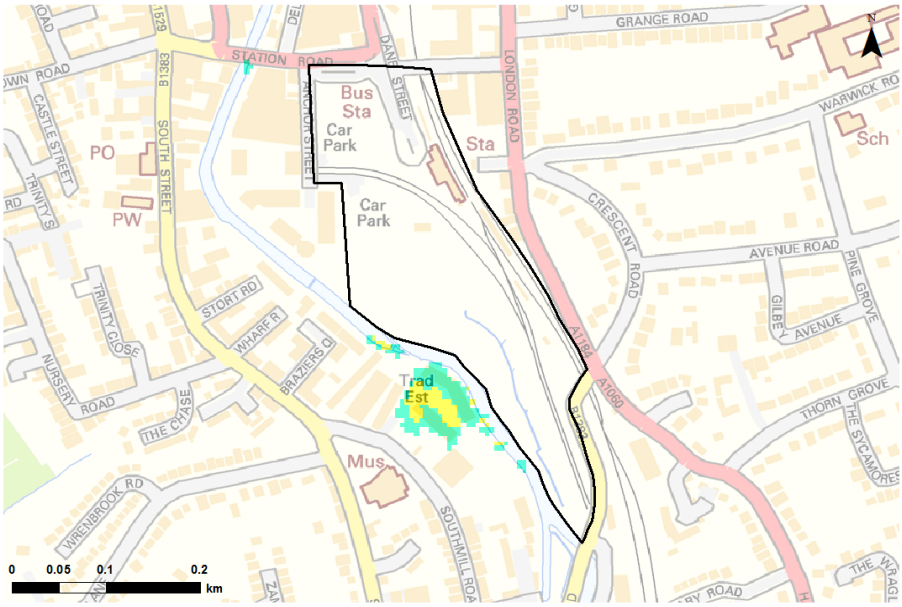
This velocity map shows only a visual representation of the river channel as hydraulic model results show water remains in-bank during the 100-year event, and therefore no velocity map of the channel is available.

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2	0.2 - 0.5	0.5 - 1.0
1.0 - 2.0	> 2.0	

Hazard Map



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This hazard map shows only a visual representation of the river channel as hydraulic model results show water remains in-bank during the 100-year event, and therefore no hazard map of the channel is available.

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Infiltration likely to be suitable. Mapping suggests a low risk of ground water flooding however, site investigations should be carried out to assess potential for drainage by infiltration. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m. A liner maybe required if there are any contamination issues within the site being brownfield
Detention		Mapping suggests that the site slopes are suitable for all forms of detention. If the site has contamination, a liner will be required.
Filtration		All filtration techniques are likely to be suitable. If the site has contamination issues, a liner will be required.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination issues, a liner will be required.

The site is not designated by the Environment Agency as previously being a landfill site.

The site is not located within any Environment Agency designated Source Protection Zone.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences: The site is not formally defended; however, there is a flood defence present on the opposite bank (right hand bank) providing an "area benifited by defence" for the trading estate.
Flood Warning: This site is partially covered by 'The River Stort at Bishops Stortford including Spellbrook' Flood Warning Area as well as the 'River Stort and Stansted Brook Catchment' Flood Alert Area (062WAF51Stort).
Access & Egress: Access and egress to the site is possible via Stations Road, London Road (B1282) and London Road (A1184). The majority of these roads are impacted by surface water flooding according to uFMfSW. Given that the site is shown to be significantly impacted by fluvial flooding to the south, consideration is needed to how safe access and egress can be achieved to the whole site in times of flood.
Climate Change: Climate change mapping indicates the following impacts for the future: • Increased storm intensities. • Increased water extent, depth, velocity and hazard in the watercourse. • Climate change may also increase the extent, depth and frequency of surface water flooding.
Implications for Development: • Use of the Sequential approach to development is limited due to the amount of the site that is covered by Flood Zone 2; therefore any 'Highly Vulnerable' development placed within the Flood Zone will be required to pass the Exception Test. • The main access and agress routes are affected by surface water flooding, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood. • Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes. • Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes. • Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site and the proportion of the site at risk from flooding, the type of SuDS system used may be influenced by amount of land available. • The site is covered by the Environment Agency's Flood Warning Service. Given the potential access and egress issues, development may need to consider provision of safe refuge in the event of occupiers being unable to evacuate. • The site is not known to benefit from any flood defences. Given the size and location of the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment given the land requirement that any strategic storage solution would require.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.

• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.

• The peak flows of the unnamed watercourse should be considered when considering drainage.

• Resilience measures will be required if buildings are situated in the flood risk area.

• Safe access and egress will need to be demonstrated; currently access and egress is affected by surface water flooding.

• Assessment for runoff should include allowance for climate change effects.

• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.

• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:

  o Reducing volume and rate of runoff
  o Relocating development to zones with lower flood risk
  o Creating space for flooding.
  o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

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EH6 - WGC, East of Welwyn				
OSNGR: 527149,212085	Area: 75.34ha		Majority Greenfield	
Flood Zone Coverage: *based on 2D Jflow modelling	**FZ3b** 3.09%*	**FZ3a** 4.65%*	**FZ2** 9.06%*	**FZ1** 83.20%*

Proposed Development Details:
1,350 homes, primary and secondary education, health, retail and green space

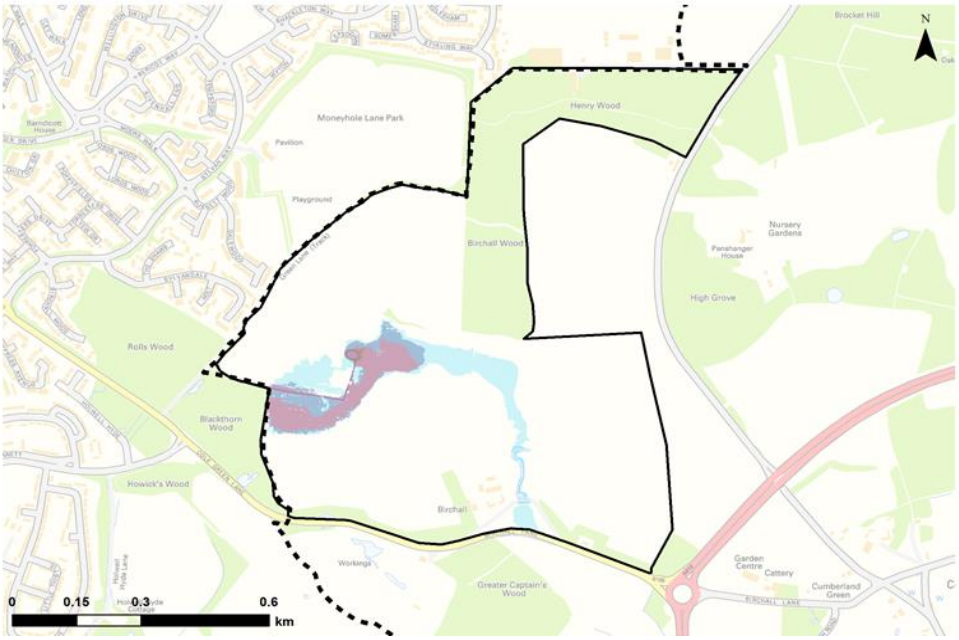
Exception Test Required?
Likely, as the flood risk from the unnamed drain intersects the site, which may constrain where development can be placed.
The Exception Test is needed if:
"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.
"Essential Infrastructure" development in FZ3b will also require the Exception Test.
"Highly Vulnerable" development should not be permitted within FZ3a and FZ3b.
"More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b

NPPF Guidance:
• For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
• The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new developmenton surface water run-off should be considered.
• Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond thrugh the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:

The vast majority of the site is located within Flood Zone 1 and is considered to be at low risk of fluvial flooding. Flood risk is present from an unnamed drain which which flows from the site's western edge, eastwards to a small pond. Whislt the drain is shown to end here, there may be overland flow routes following topography, such as in the more extreme flood events. Factoring in climate change at 25%, 35% and 70% does not significantly affect the area at risk of fluvial flooding. Surface water flooding is shown to occur following the drainage channel topography and a new overland flow route is seen from the north in the 1,000-year extent, with pockets of surface water flooding in the lower return periods.

Flood Zone Map



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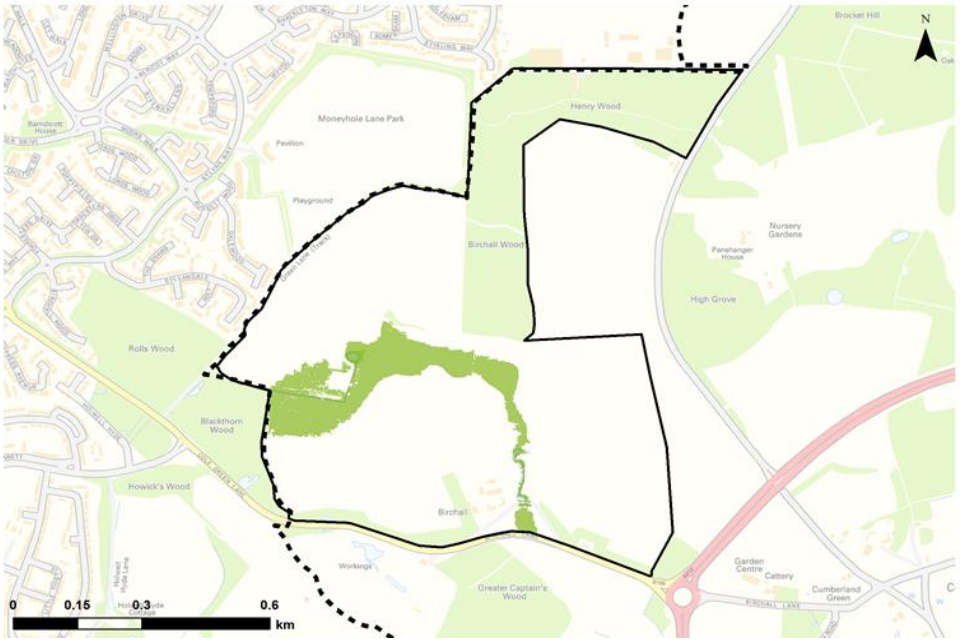
This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map



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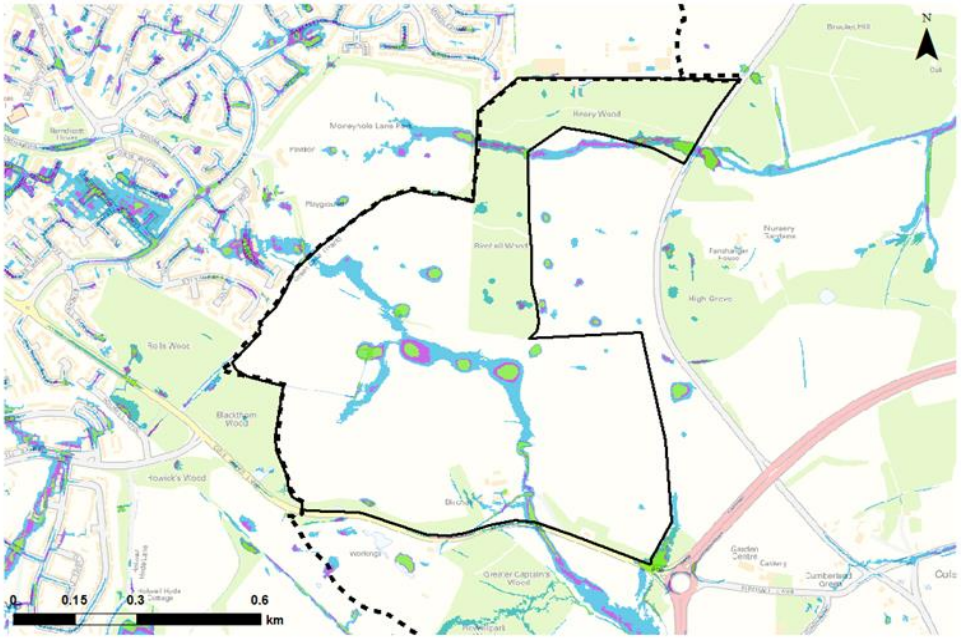
Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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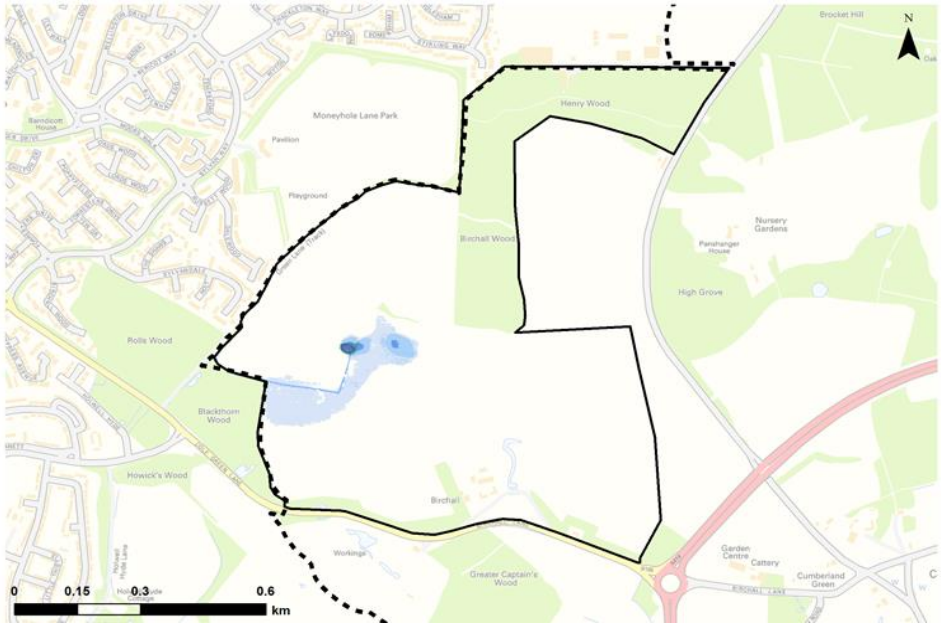
Potential Site Allocations
uFMfSW* 30-year Extent
uFMfSW* 1,000-year Extent
Council boundary
uFMfSW* 100-year Extent

Depth Map



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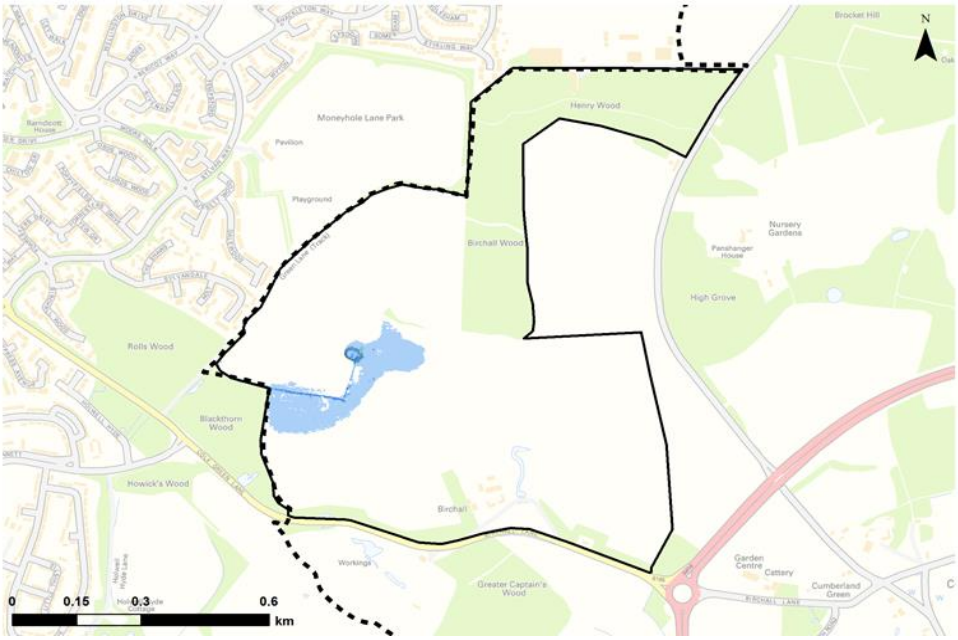
This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
0.10 - 0.50	1.00 - 1.50	2.50 - 3.00	>4.00
	1.50 - 2.00	3.00 - 3.50	

Velocity Map



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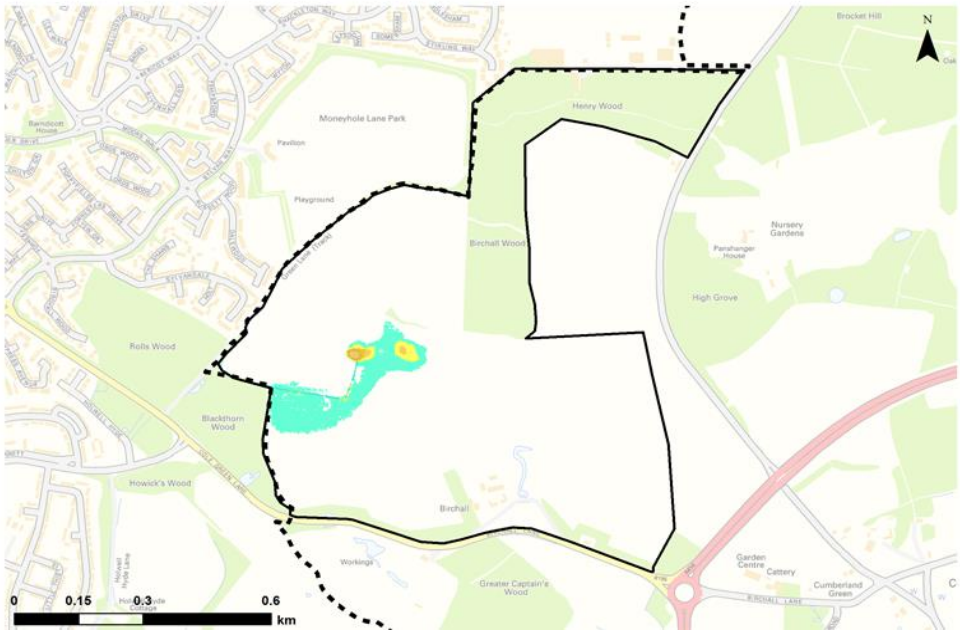
This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2	0.2 - 0.5	1.0 - 2.0
	0.5 - 1.0	> 2.0

Hazard Map



Contains Ordnance Survey data. © Crown copyright and database rights 2016

This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Mapping suggest the soils are fairly impermeable in this area. However, there is risk due to contaminated land located adjacent to site which may make infiltration unsuitable. Site investigations should be carried out to assess potential for drainage by infiltration.
Detention		This option may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has contamination, due to its proximity to landfill, a liner will be required.
Filtration		Feasibility of filtration options should be assessed as part of a site specific assessment. If this feature is feasible it should be located where the depth to the water table is >1m, additionally a liner maybe required to prevent contamination at the site.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination issues, a liner will be required.

This site has areas within its boundary designated by the Environment Agency as being a landfill site. A thorough ground investigation will be required as part of a detailed FRA to determine the extent of the contamination and the impact this may have on SuDS.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Proposed SuDS should be discussed within relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Flood Defences: There are no flood defences at this site.
Flood Warning: There are currently no flood warning areas or flood alerts covering this site.
Access & Egress: Access and egress to the potential development site is via Birchall Lane (B195) and Station Road. These give acces to the south and north east of the site respectively. However, due to surface water and fluvial flooding in the north and south access may be restricted at the center of the site during a flood event. Consideration is needed to how safe access and egress can be achieved to the whole site in times of flood.
Climate Change: Climate change mapping indicates the following impacts for the future: • Increased storm intensities. • The increase in Flood Zone 3a outline with differing climate change allowances is minimal. • The floodplain of the unnamed drain appears, with 70% climate change allowance, very similar to Flood Zone 2. It may, however, increase the depth, velocty or hazard of flooding in the area affected. • Climate change may also increase the extent, depth and frequency of surface water flooding.
Implications for Development: •Use of the Sequential approach means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped. • The main access and egress routes are affected by surface water flooding in some places, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood. • Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes. • Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes •Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development. • The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required. • The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk downstream from the drains; development should consider the feasibility of including any strategic flood risk solutions, depending on the land available.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.

• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.

• The peak flows of the unnamed watercourse should be considered when considering drainage.

• Resilience measures will be required if buildings are situated in the flood risk area.

• Safe access and egress will need to be demonstrated.

• Assessment for runoff should include allowance for climate change effects.

• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.

• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:

  o Reducing volume and rate of runoff
  o Relocating development to zones with lower flood risk
  o Creating space for flooding.
  o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

• Developers may need to undertake more detailed investigations/ modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH7 - Left, Ware, North and East of Ware				
OSNGR: 536276,215745	Area: 79.80ha		Greenfield	
Flood Zone Coverage: *based on 2D Jflow modelling	**FZ3b** 2.05%*	**FZ3a** 2.31%*	**FZ2** 2.52%*	**FZ1** 93.12%*

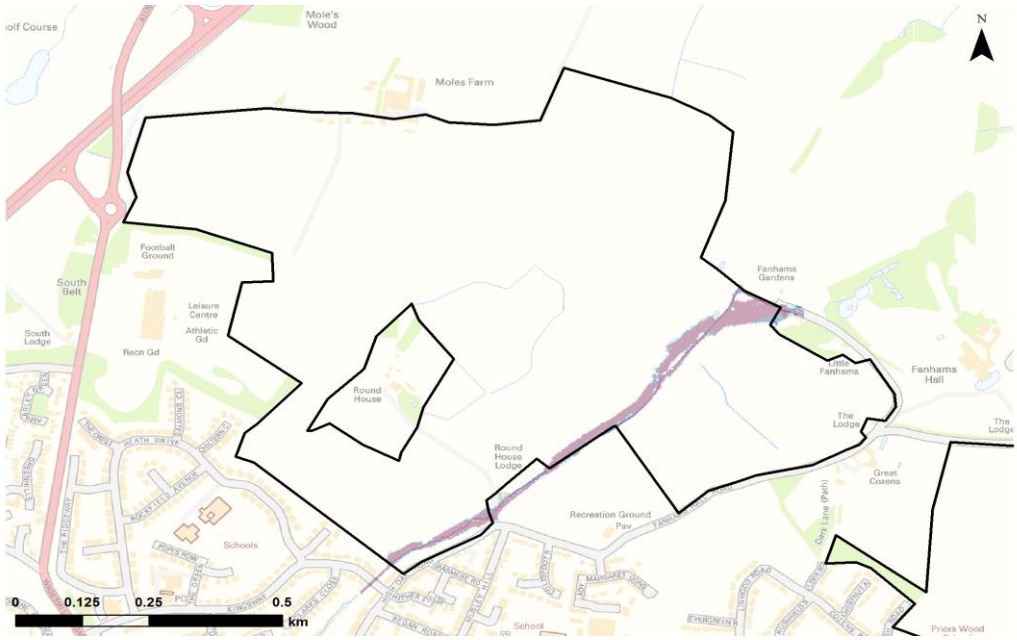
Proposed Development Details:
There will be 1,500 homes, primary and secondary education, health, employment, retail and open space split between EH8 and this site.

Exception Test Required?
Likely, as the flood risk from the unnamed watercourse intersects the site which may constrain where development can be placed.
The Exception test is needed if:
"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2.
"Essential Infrastructure" development in FZ3b will also require the Exception Test.
"Highly Vulnerable" development should not be permitted within FZ3a and FZ3b.
"More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b

NPPF Guidance:
• For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
• The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered.
• Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:
The vast majority of the site is located within Flood Zone 1 and is considered to be at low risk of fluvial flooding. Flood risk is present from an unnamed drain flowing through the site from the north-east to the southern boundary. The floodplain of the unnamed drain appears to be fairly constrained which restricts the Flood Zone extents. Factoring in climate change at 25%, 30% and 70% does not result in significantly more of the site being affected by fluvial flooding. Surface water flooding is shown to occur along the banks of the drainage networks and in two overland flow routes with ponding at the north-western site boundary.

Flood Zone Map



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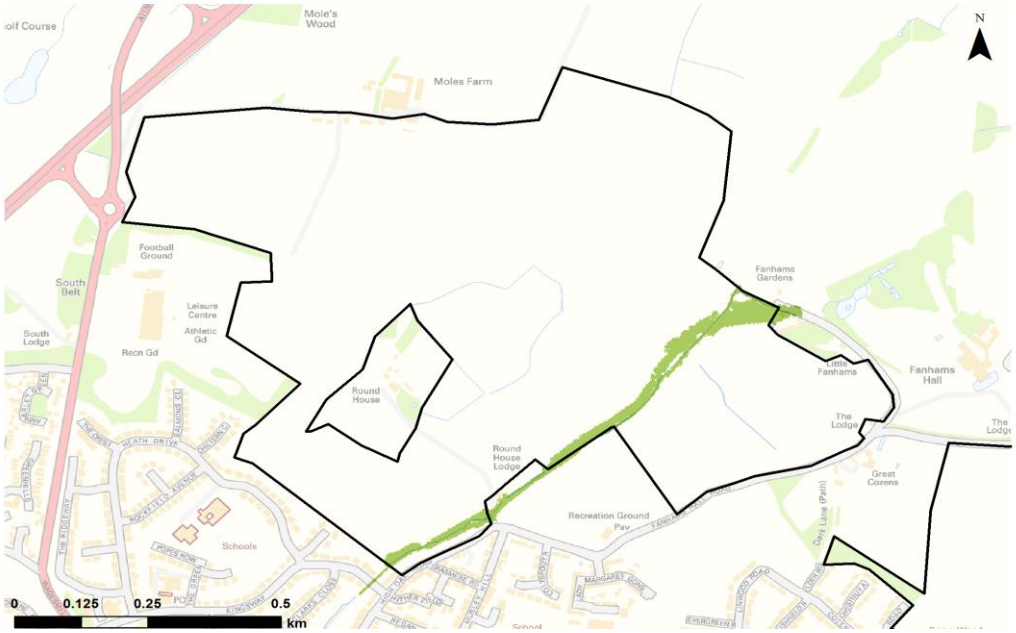
This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map



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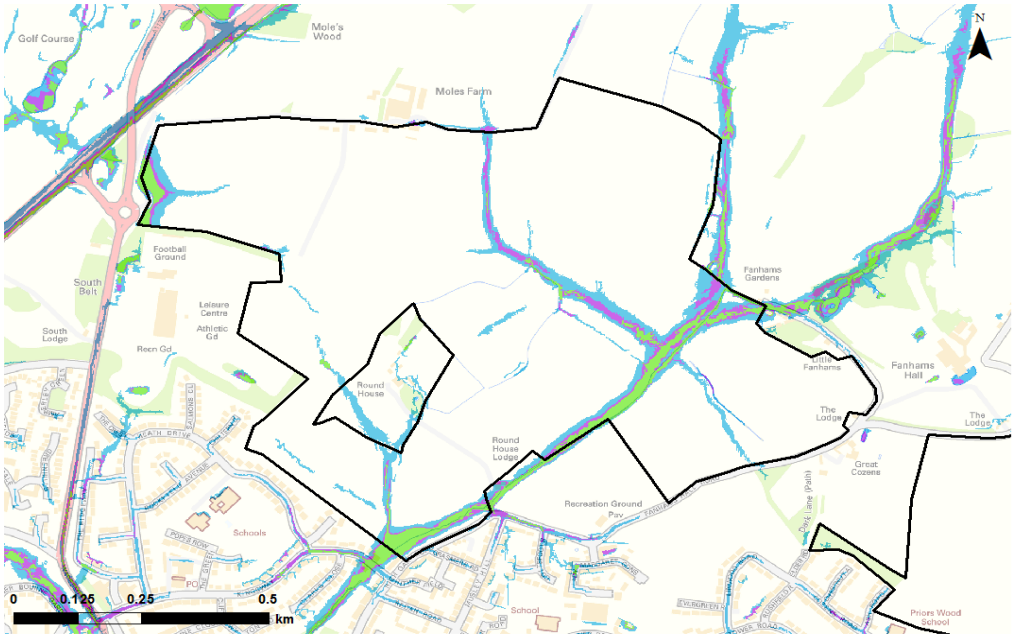
Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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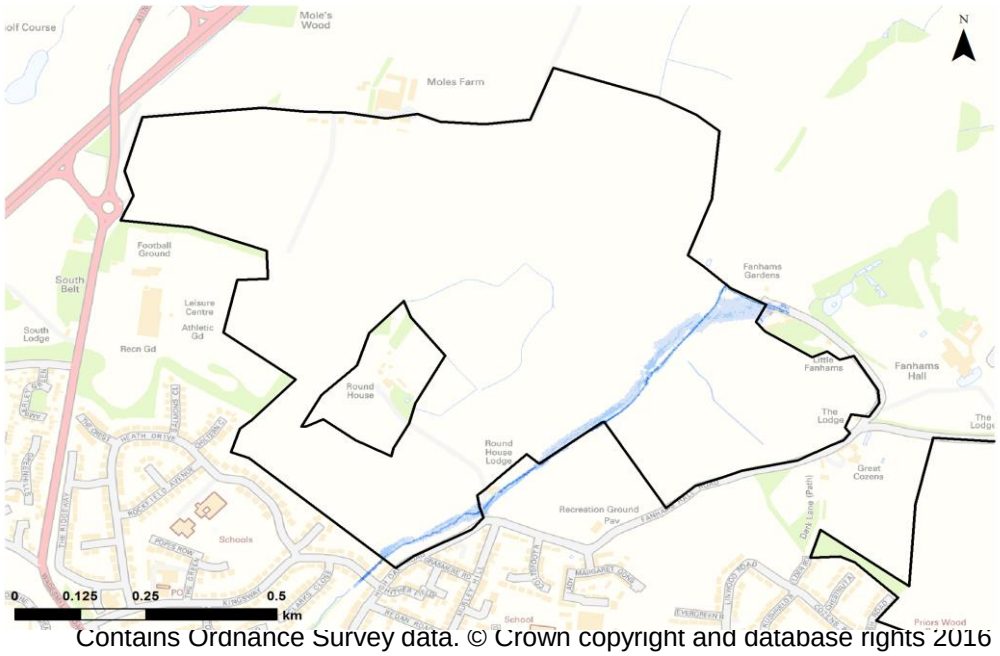
Potential Site Allocations
Council boundary
uFMfSW* 30-year Extent
uFMfSW* 100-year Extent
uFMfSW* 1,000-year Extent

Depth Map



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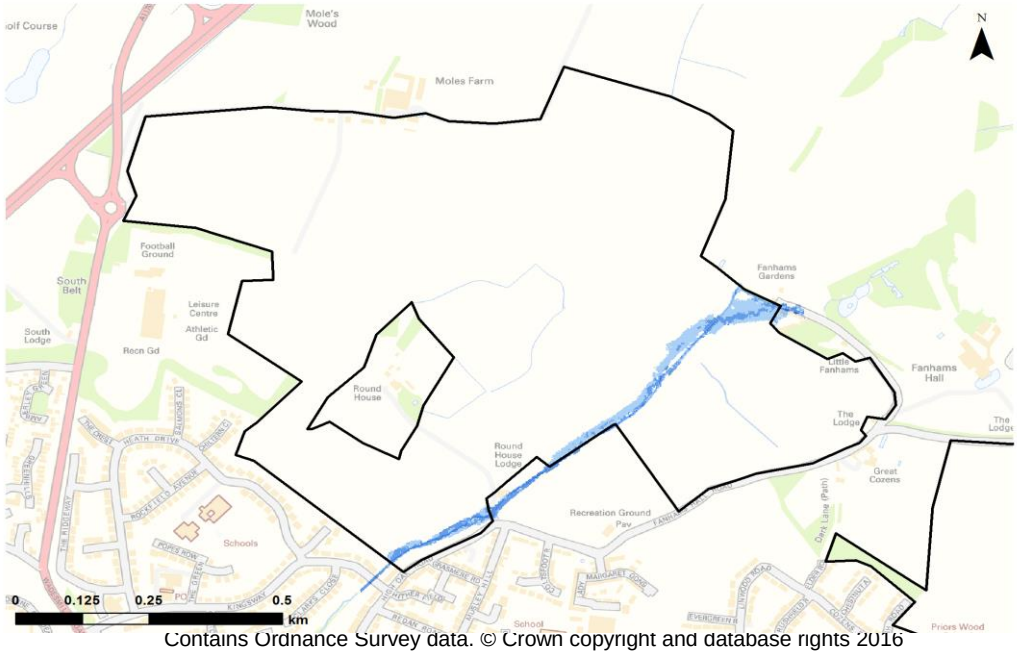
This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10
0.10 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
2.00 - 2.50
2.50 - 3.00
3.00 - 3.50
3.50 - 4.00
>4.00

Velocity Map



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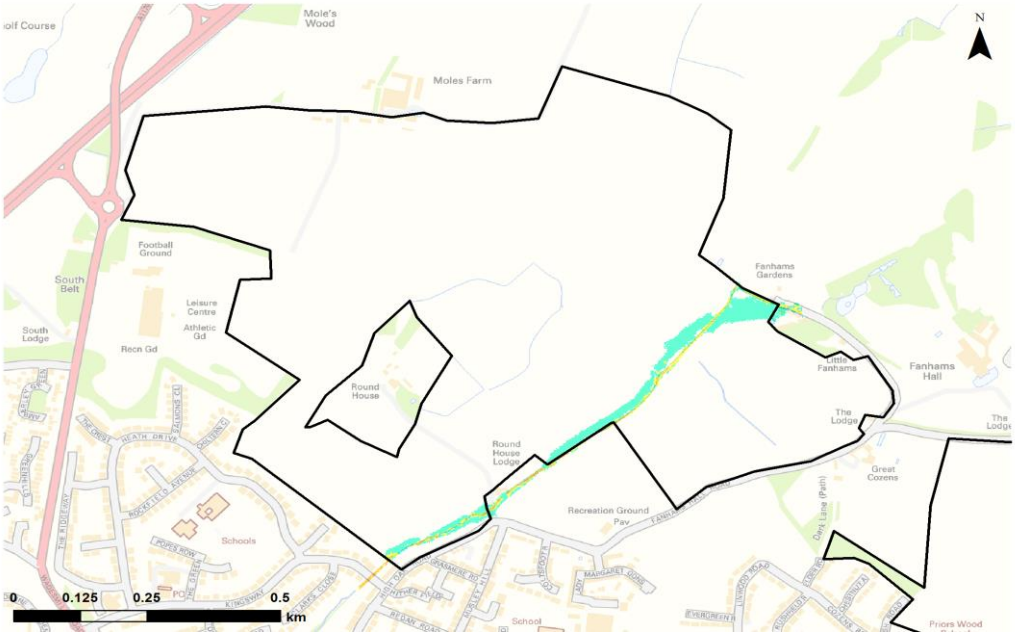
This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2
0.2 - 0.5
0.5 - 1.0
1.0 - 2.0
> 2.0

Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Mapping suggests low permeability at the site with infiltration likely to be suitable. A site investigations should be carried out to assess potential for drainage by infiltration.
Detention		Mapping suggests that the site slopes are suitable for all forms of detention.
Filtration		All filtration techniques are likely to be suitable. If the site has contamination issues, a liner will be required.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows.

The site is not designated by the Environment Agency as previously being a landfill site.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences: There are no flood defences at this site.
Flood Warning: There are currently no flood warning areas or flood alerts covering this site.
Access & Egress: Primary access and egress to the site can be provided via Wadesmill Road (A1170) and Fanhams Hall Road. These roads are shown to be susceptible to surface water flooding at certain points. The land within the site boundary that would connect to the Wadesmill Road (A1170) is in a depression and ponding occurs here from the 30-year surface water event, limiting this as an access and egress route. Fluvial and surface water flood risk divides the site; it is important that any development within the site boundary has safe access and egress in times of flood.
Climate Change: Climate change mapping indicates the following impacts for the future: • Increased storm intensities. • The increase in Flood Zone 3a outline with differing climate change allowances is minimal. • The floodplain of the unnamed drain appears, with 70% climate change allowance, very similar to Flood Zone 2. It may, however, increase the depth, velocty or hazard of flooding in the area affected. • Climate change may also increase the extent, depth and frequency of surface water flooding.
Implications for Development: •Use of the Sequential approach means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped. • The main access and egress routes are affected by surface water flooding in some places, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood. • Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes. • Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes •Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development. • The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required. • The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk downstream from the drains; development should consider the feasibility of including any strategic flood risk solutions, depending on the land available.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.

• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.

• The peak flows of the unnamed watercourse should be considered when considering drainage.

• Resilience measures will be required if buildings are situated in the flood risk area.

• Safe access and egress will need to be demonstrated; currently access and egress is affected by surface water flooding from the 30-year event.

• Assessment for runoff should include allowance for climate change effects.

• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.

• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:

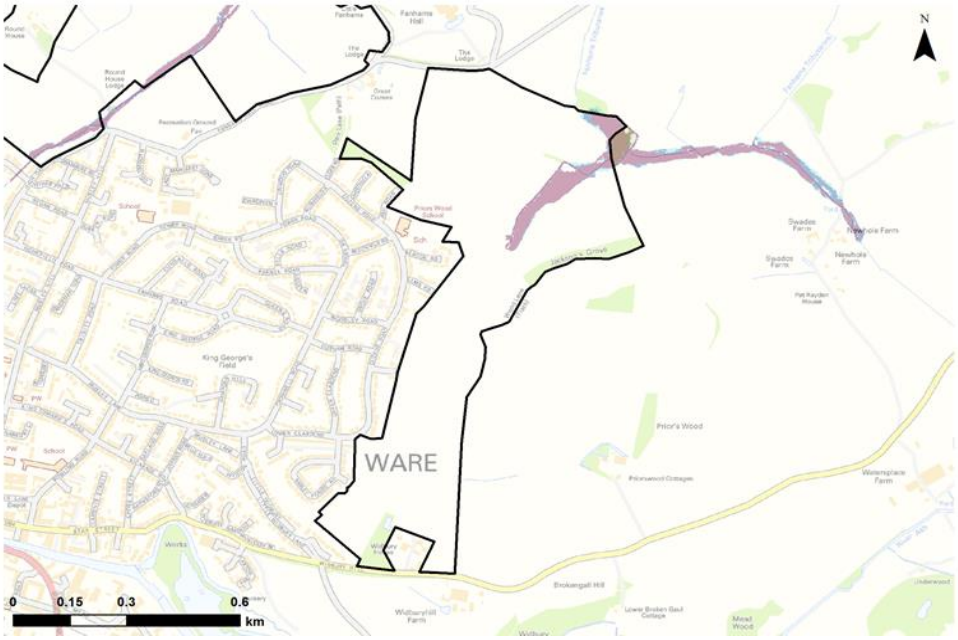
  o Reducing volume and rate of runoff
  o Relocating development to zones with lower flood risk
  o Creating space for flooding.
  o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

• Developers may need to undertake more detailed investigations/ modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH8 - Right, Ware, North and East Ware					
OSNGR: 537243,214869	Area: 46.34ha		Greenfield		
Flood Zone Coverage: *based on 2D Jflow modelling	**FZ3b** 3.95%*	**FZ3a** 4.29%*	**FZ2** 4.6%*	**FZ1** 87.16%*	
Proposed Development Details: There will be 1,500 homes, primary and secondary education, health, employment, retail and open space split between EH7 and this site.					
Exception Test Required? Likely, as an unnamed watercourse starts flowing to the north-east from within the centre of the site, which may constrain where development can be placed. The Exception Test is needed if: "More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2. "Essential Infrastructure" development in FZ3b will also require the Exception Test. "Highly Vulnerable" development should not be permitted within FZ3a and FZ3b. "More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b					
NPPF Guidance: • For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new developmenton surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond thrugh the layout and form of the development and through appropriate sustainable drainage techniques.					
Sources of Flood Risk: The vast majority of the site is located within Flood Zone 1 and is considered to be at low risk of fluvial flooding. Flood risk is present from the Fanhams Tributaries which flows from the central north area of the site, in a north-easterly direction, meeting another drain on the boundary, before flowing east. Factoring in climate change at 25% 35% and 70% does not significantly affect the area at risk of fluvial flooding. Surface water flood risk predominantly corresponds to the alignment of the watercourse but also a smaller overland flow route is present which flows through the south of the site from east to west.					

Flood Zone Map



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This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map



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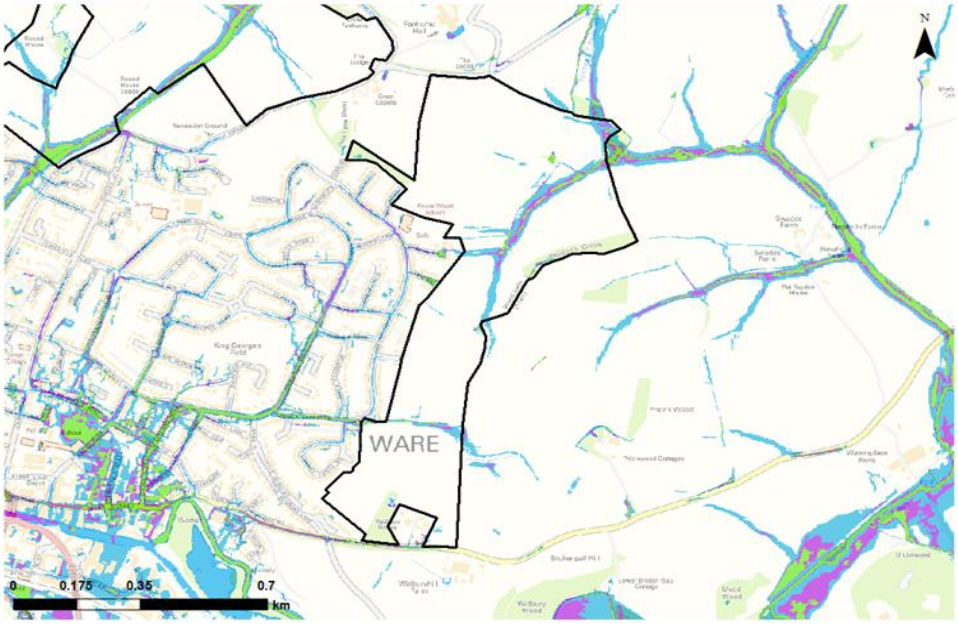
Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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Potential Site Allocations
uFMfSW* 30-year Extent
uFMfSW* 1,000-year Extent
Council boundary
uFMfSW* 100-year Extent

Depth Map



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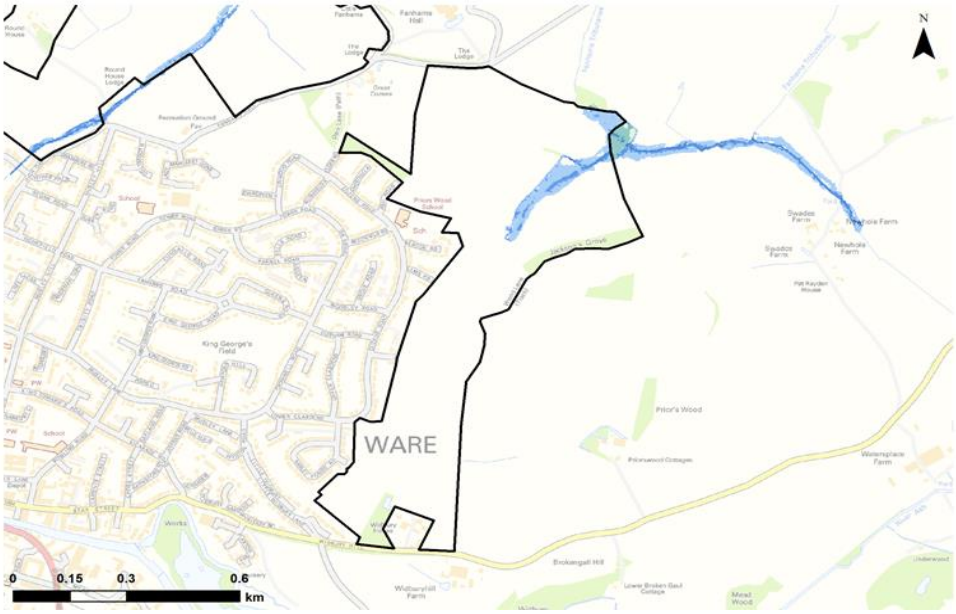
This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
0.10 - 0.50	1.00 - 1.50	2.50 - 3.00	>4.00
	1.50 - 2.00	3.00 - 3.50	

Velocity Map



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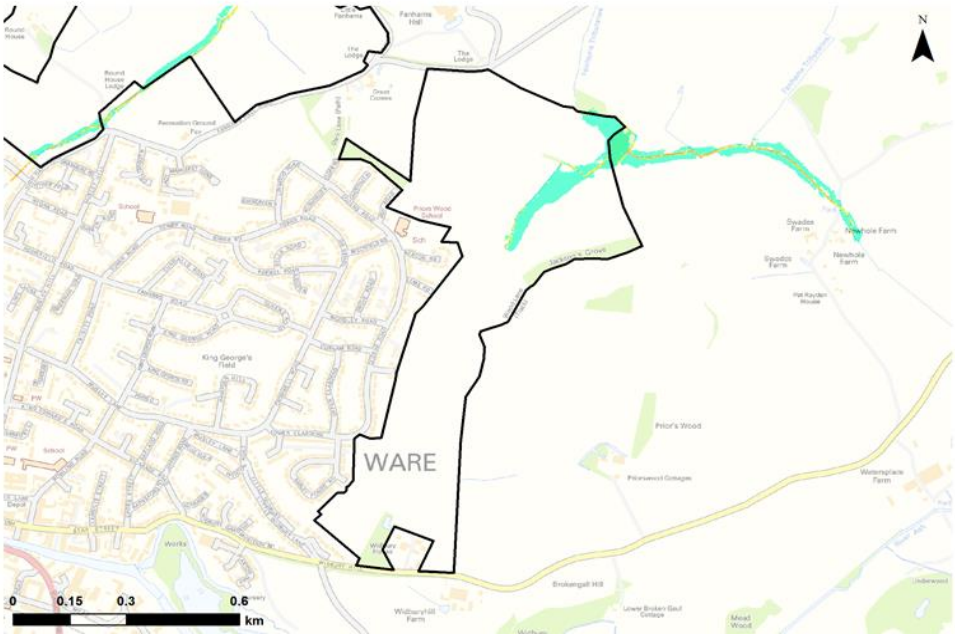
This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2	0.2 - 0.5	0.5 - 1.0	1.0 - 2.0
			> 2.0

Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		All forms of source control are likely to be suitable.
Infiltration		Infiltration likely to be suitable. Mapping suggests a low risk of ground water flooding however, site investigations should be carried out to assess potential for drainage by infiltration.
Detention		Mapping suggests that the site slopes are suitable for all forms of detention.
Filtration		All filtration techniques are likely to be suitable.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows.

The site is not designated by the Environment Agency as previously being a landfill site.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Areas of this site are located within a Zone 1 groundwater protection zone. As such inflitration techniques should only be used used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences: There are no flood defences at this site.
Flood Warning: There are currently no flood warning areas or flood alerts covering this site.
Access & Egress: Primary access and egress to the site can be provided via Wadesmill Road (A1170) and Fanhams Hall Road. These roads are shown to be susceptible to surface water flooding at certain points. The land within the site boundary that would connect to the Wadesmill Road (A1170) is in a depression and ponding occurs here from the 30-year surface water event, limiting this as an access and egress route. Fluvial and surface water flood risk divides the site; it is important that any development within the site boundary has safe access and egress in times of flood.
Climate Change: Climate change mapping indicates the following impacts for the future: • Increased storm intensities. • The increase in Flood Zone 3a outline with differing climate change allowances is minimal. • The floodplain of the unnamed drain appears, with 70% climate change allowance, very similar to Flood Zone 2. It may, however, increase the depth, velocty or hazard of flooding in the area affected. • Climate change may also increase the extent, depth and frequency of surface water flooding.
Implications for Development: •Use of the Sequential approach means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped. • The main access and egress routes are affected by surface water flooding in some places, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood. • Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes. • Development should also ensure that there is no increase in flood risk that may exacerbate flooding to routes •Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site, the type of SuDS system used is less likely to be limited by the amount of land available for development. • The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required. • The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk downstream from the drains; development should consider the feasibility of including any strategic flood risk solutions, depending on the land available.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.

• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.

• The peak flows of the unnamed watercourse should be considered when considering drainage.

• Resilience measures will be required if buildings are situated in the flood risk area.

• Safe access and egress will need to be demonstrated; currently access and egress is affected by surface water flooding from the 30-year event.

• Assessment for runoff should include allowance for climate change effects.

• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.

• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:

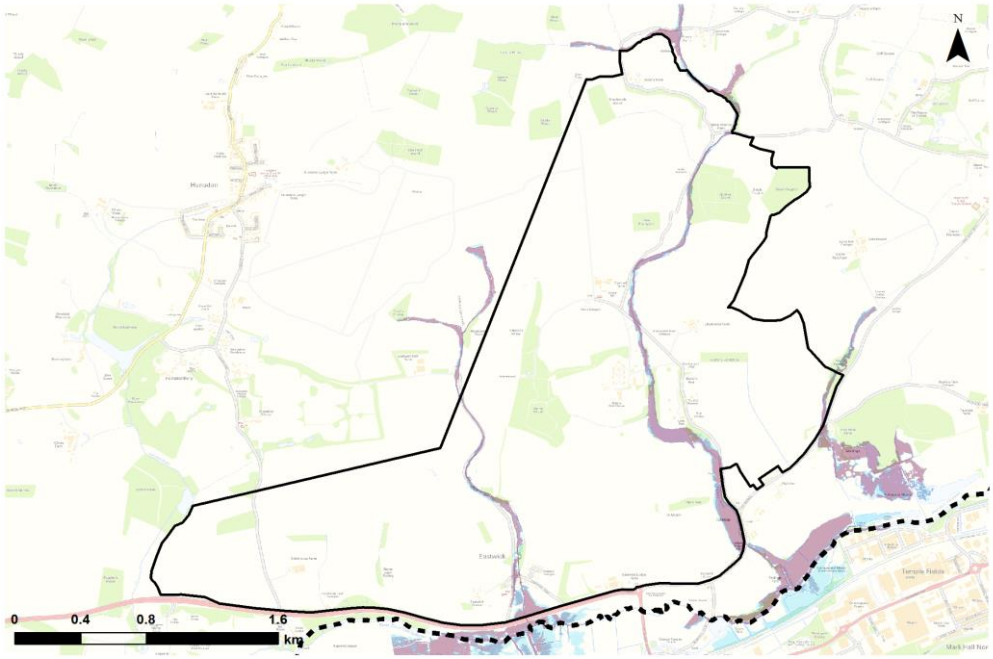
  o Reducing volume and rate of runoff
  o Relocating development to zones with lower flood risk
  o Creating space for flooding.
  o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

• Developers may need to undertake more detailed investigations/ modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH9 - GIL, Gilston: Gilston Area				
OSNGR: 544060,213119	Area: 697.75ha		Mixed Greenfield and Brownfield	
Flood Zone Coverage: *based on 2D Jflow modelling	**FZ3b** 2.15%*	**FZ3a** 2.65%*	**FZ2** 3.2%*	**FZ1** 92%*
Proposed Development Details: 10,000 homes, primary and secondary education, health, retail and green space.				
Exception Test Required? Unlikely, as the majority of the site is located within Flood Zone 1. The Exception Test is required if: "More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2. "Essential Infrastructure" development in FZ3b will also require the Exception Test. "Highly Vulnerable" development should not be permitted within FZ3a and FZ3b. "More Vulnerable" and "Less Vulnerable" development should not be permitted within FZ3b				
NPPF Guidance: • For development proposals on sites comprising one hectare or above in Flood Zone 1, the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA. • The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new developmenton surface water run-off should be considered. • Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.				
Sources of Flood Risk: A very small area of the site is at risk of fluvial flooding from Fiddlers' Brook and and the unnamed drain which flows along Eastwich Hall Lane; both of which flow south to join the River Stort (Navigation) located just outside of the southern site boundary. The vast majority of the site is located in Flood Zone 1 and therefore is at little risk of fluvial flooding. Factoring in climate change at 25%, 30% and 70% does not significantly affect the area at risk of fluvial flooding. Parts of the site are also shown to be affected by surface water flooding; these areas tend to correspond with the watercourses.				

Flood Zone Map



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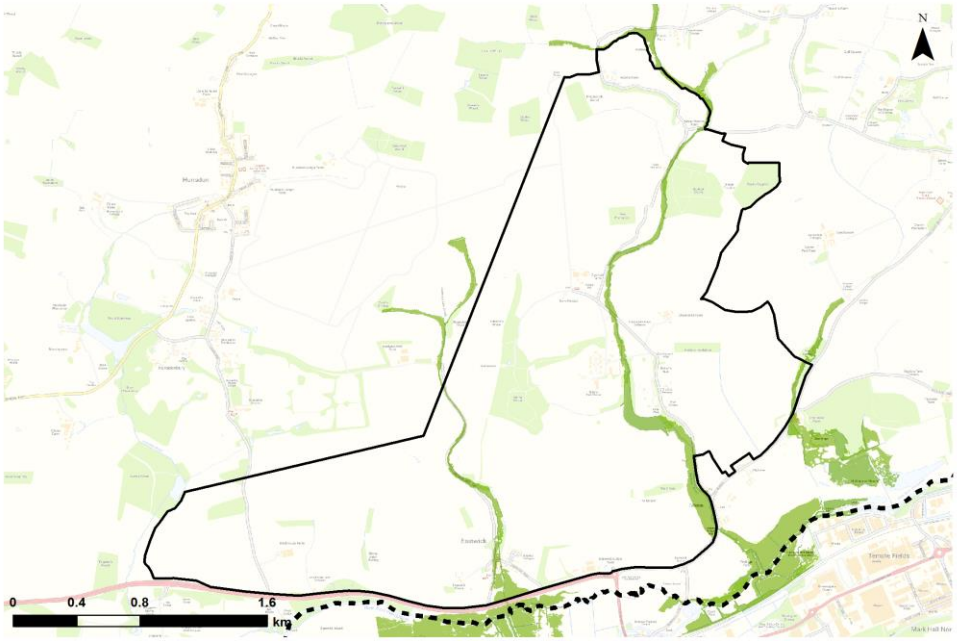
This site was not represented in the Environment Agency's Flood Zones, but OS mapping showed a drain running through the site, therefore 2D generalised modelling using Jflow software has been undertaken to obtain indicative flood extents, using the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2. Developers may need to consider undertaking more detailed hydraulic modelling at the site as part of a site-specific FRA.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map



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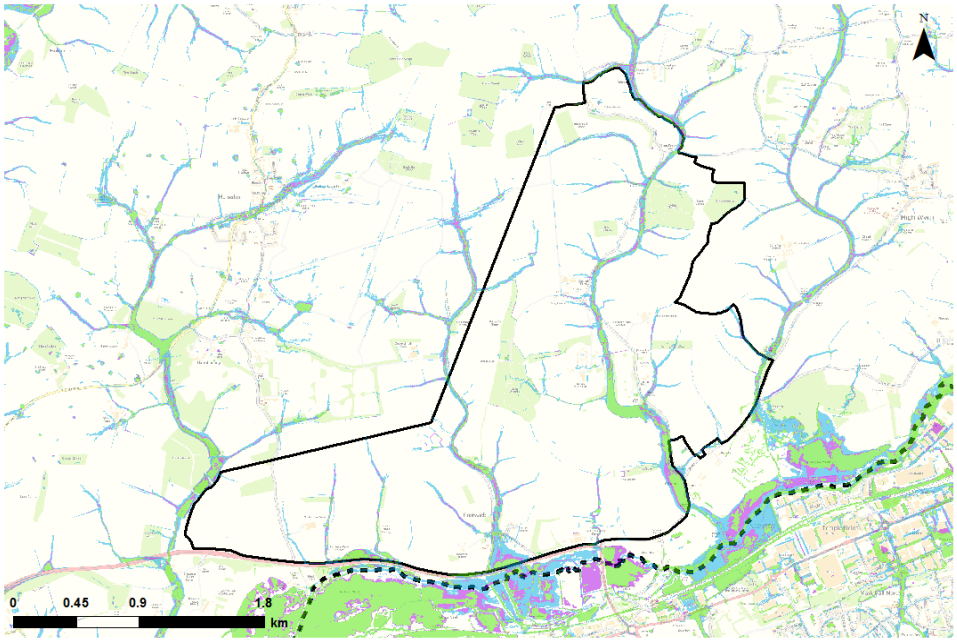
Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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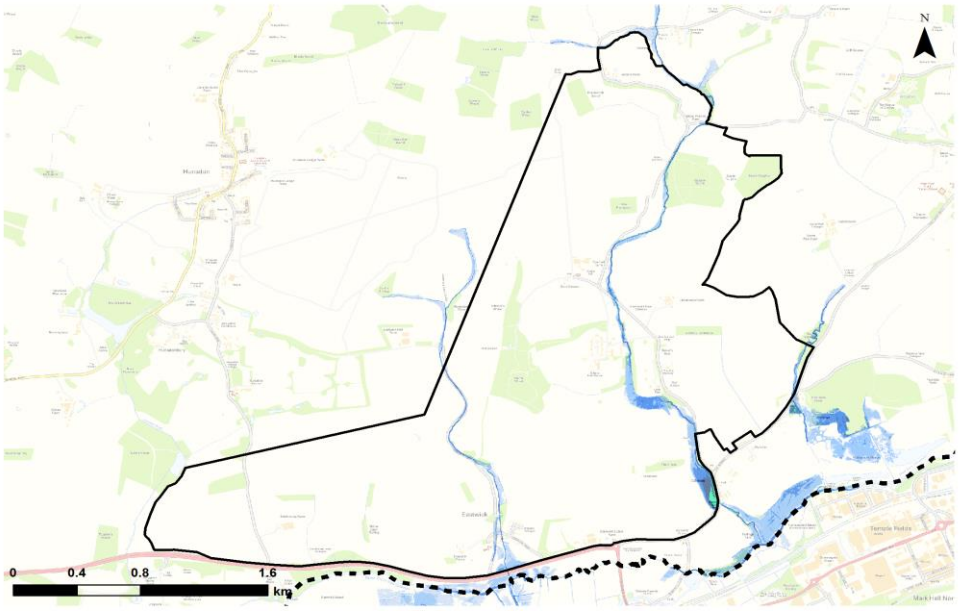
Potential Site Allocations
uFMfSW* 30-year Extent
uFMfSW* 1,000-year Extent
Council boundary
uFMfSW* 100-year Extent

Depth Map



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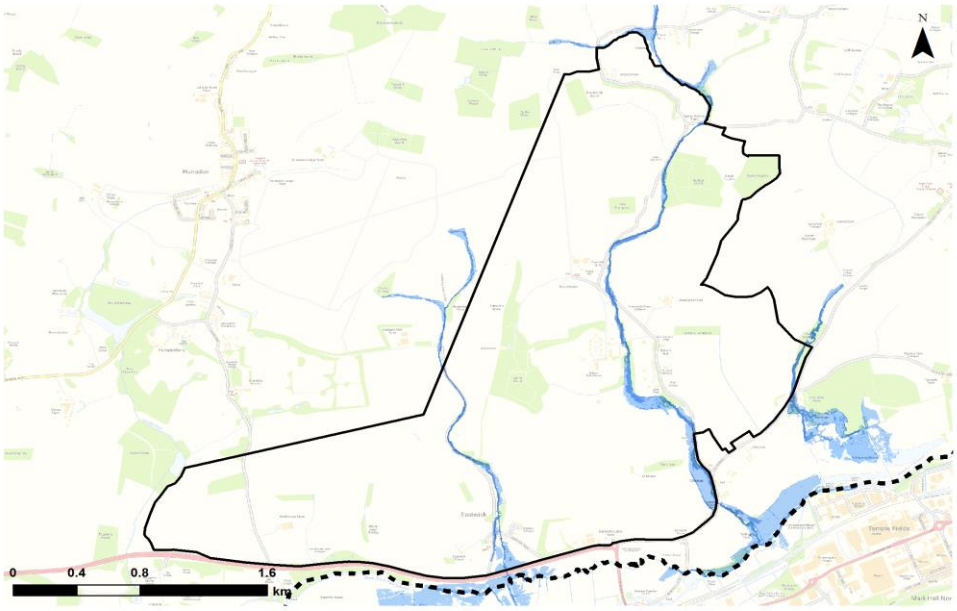
This depth map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10
0.10 - 0.50
0.50 - 1.00
1.00 - 1.50
1.50 - 2.00
2.00 - 2.50
2.50 - 3.00
3.00 - 3.50
3.50 - 4.00
>4.00

Velocity Map



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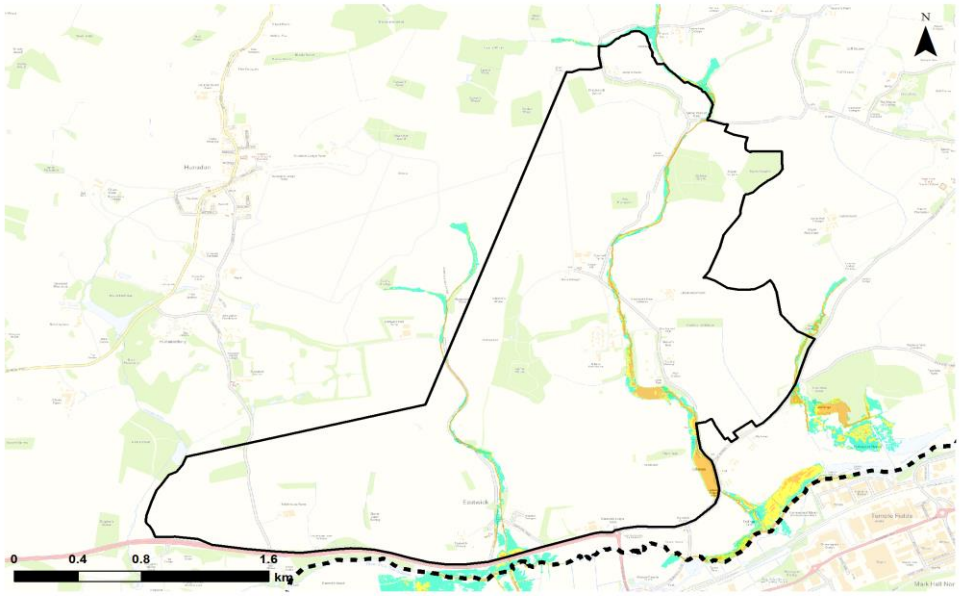
This velocity map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2
0.2 - 0.5
0.5 - 1.0
1.0 - 2.0
> 2.0

Hazard Map



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This hazard map is an output from Jflow 2D generalised modelling, and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most source control techniques are likely to be suitable.
Infiltration		Mapping suggests split in the risk of groundwater flooding and underlying soils in the site. The southern area of the site near to the boundary, soil type and the aStGWF map indicate that inflitration would not be suitable. The remander of the site infiltration, most infiltration techniques are likely to be suitable. Further site investigation should be carried out to assess
Detention		This option may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has groundwater issues or contamination issues in areas of brownfiels, a liner will be required.
Filtration		This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination or groundwater issues; a liner will be required.

The site is not designated by the Environment Agency as previously being a landfill site.

A proportion of the site is located with a Source Protection Zone. Techniques such infiltration should only be used where there are suitable levels of treatment is possible or infiltration may not be permitted.

Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences:
There are no flood defences at this site.

Flood Warning:
This site is partly covered by 'The River Stort at Harlow including Roydon' Flood warning Area following three of the watercourses which intersect the site. Two small areas along the southern boundary are covered by 'The River Stort, Stansted Brook and their tributaries from Clavering to Hoddesdon including Stanstead Mountfitchet, Bishops Stortford, Sawbridgeworth and Harlow ' Flood Alert Area (062WAF51Stort).

Access & Egress:
Access and egress to the site is possible via the A414, Eastwick Road, Eastwick Hall Lane, Church Lane and two unnamed roads to the north of the site. The majority of these roads are impacted by surface water flooding according to uFMfSW and fluvial flooding. Consideration is needed as to how safe access and egress can be achieved to the whole site in times of flood. Fluvial flood risk divides the site; it is important that development across the site has safe access and egress in times of flooding.

Climate Change:

Climate change mapping indicates the following impacts for the future:
• Increased storm intensities.
• The increase in Flood Zone 3a outline with differing climate change allowances is minimal within the site boundary.
• The floodplain of the unnamed drain appears to be fairly constrained within this area; with 70% climate change allowance the flood outline is similar to Flood Zone 2. It may, however, increase the depth, velocity and hazard of flooding in the area affected.
• Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:
•Use of the Sequential approach means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.
• The main access and egress routes are affected by surface water flooding in some places, therefore safe access and egress will be required by development, or safe refuge provided if evacuation is not possible during a flood for the lifetime of the development.
• Climate change may increase the extent of surface water and fluvial flooding in the future and have the potential to affect routes.
• Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access and egress routes
•Broadscale assessment of suitable SuDS has indicated a number of different types may be possible.
• The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.
• The site is not known to benefit from any flood defences. Given the size and location of the site, it is possible the site could be used to implement strategic solutions to alleviate flood risk downstream from the drains; development should consider the feasibility of including any strategic flood risk solutions, depending on the land available.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.

• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.

• The peak flows of the unnamed watercourse should be considered when considering drainage.

• Resilience measures will be required if buildings are situated in the flood risk area.

• Safe access and egress will need to be demonstrated; currently access and egress is affected by fluvial and surface water flooding.

• Assessment for runoff should include allowance for climate change effects.

• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.

• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:

  o Reducing volume and rate of runoff
  o Relocating development to zones with lower flood risk
  o Creating space for flooding.
  o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

• Developers may need to undertake more detailed investigations/ modelling of the unnamed watercourse to confirm flood risk at the site. The Jflow outputs present an indication of flood risk in the absence of Environment Agency Flood Zones; however, this does not incorporate channel/ structure topographic survey and assumes a channel capacity of QMED.

EH10 - SAWB3, Sawbridgeworth: South of West Road					
OSNGR: 547617,215113	Area: 9.792997		Greenfield		
Flood Zone Coverage:	**FZ3b** 0.36%	**FZ3a** 0.09%	**FZ2** 1.76%	**FZ1** 97.79%	

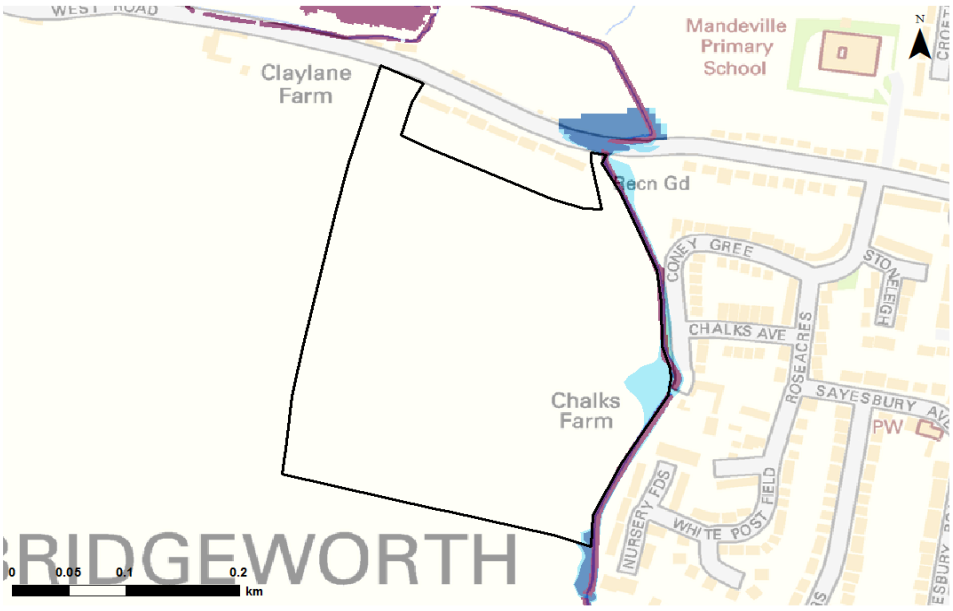
Proposed Development Details:
175 homes and green space.

Exception Test Required?
Unlikely, as the majority of the site is located in Flood Zone 1.

NPPF Guidance:
• For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
• The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new developmenton surface water run-off should be considered.
• Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:
A very small area of the site is at risk of fluvial flooding from an unnamed watercourses located just outside of the eastern site boundary. The vast majority of the site is on higher ground located in Flood Zone 1 and therefore is at little risk of fluvial flooding. The site is at limited risk of surface water flooding adjacent to the unnamed watercourse along the western site boundary.

Flood Zone Map



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The Flood Zones in this map are derived from from existing model results from the Stort Tributaries modelling (Sawbridgeworth Brook). They use the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map



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Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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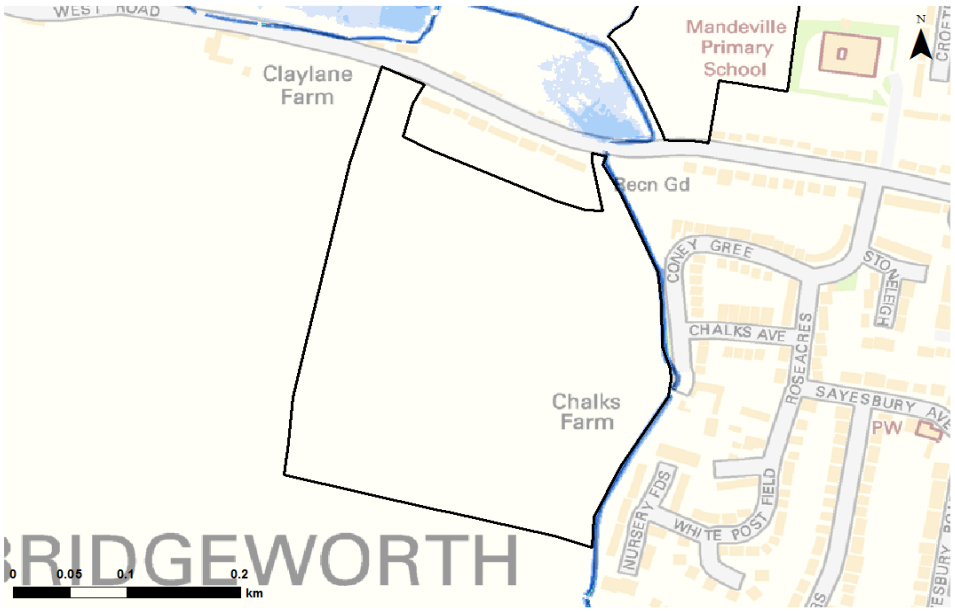
Potential Site Allocations
Council boundary
uFMfSW* 30-year Extent
uFMfSW* 100-year Extent
uFMfSW* 1,000-year Extent

Depth Map



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This velocity map is derived from the existing Environment Agency Stort Tributaries modelling (Sawbridgeworth Brook)and represents the 100-year event

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10	1.00 - 1.50	2.50 - 3.00
0.10 - 0.50	1.50 - 2.00	3.00 - 3.50
0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
		>4.00

Velocity Map



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This velocity map is derived from the existing Environment Agency Stort Tributaries modelling (Sawbridgeworth Brook) and represents the 100-year event

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2	0.5 - 1.0	> 2.0
0.2 - 0.5	1.0 - 2.0	

Hazard Map



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This hazard map is derived from the existing Environment Agency Stort Tributaries modelling (Sawbridgeworth Brook) and represents the 100-year event

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most forms of source control are likely to be suitable.
Infiltration		Mapping suggests low permeability at the site with infiltration likely to be suitable. A site investigations should be carried out to assess potential for drainage by infiltration.
Detention		Mapping suggests that the site slopes are suitable for all forms of detention.
Filtration		All filtration techniques are likely to be suitable. If the site has contamination issues, a liner will be required.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination issues, a liner will be required.

The site is not designated by the Environment Agency as previously being a landfill site.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences:

There are no flood defences at this site.

Flood Warning:

This site is is not currently covered by a Flood Warning Area at the moment but is partly covered by 'The River Stort, Stansted Brook and their tributaries from Clavering to Hoddesdon including Stanstead Mountfitchet, Bishops Stortford, Sawbridgeworth and Harlow ' Flood Alert Area (062WAF51Stort).

Access & Egress:

Access and egress to the site is possible via West Road and Coney Green. Both of these roads are impacted by surface water flooding according to uFMfSW. Given that the site is shown to be significantly impacted by fluvial flooding to the south, consideration is needed as to how safe access and egress can be achieved to the whole site in times of flood.

Climate Change:

Climate change mapping indicates the following impacts for the future:

• Increased storm intensities.

• The increase in Flood Zone 3a outline with differing climate change allowances is minimal within the site boundary.

• The floodplain of the unnamed drain appears to be fairly constrained within this area; with 70% climate change allowance the flood outline is similar to Flood Zone 2. It may, however, increase the depth, velocity and hazard of flooding in the area affected.

• Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

•Use of the Sequential approach to development means, given the size of the site, development can be placed away from the Flood Zones, with the area affected by the Flood Zones left undeveloped.

• Access and egress routes are at risk from surface water flooding; in order to pass the Exception Test, development will need to ensure that safe access and agress can be provided for the lifetime of the development.

• Broadscale assessment of suitable SuDS has indicated a number of different types may be possible.

• Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access/ egress routes

• The site is not covered by the Environment Agency's Flood Warning Service. However, if development is placed outside of the Flood Zones, then access to a Flood Warning would not be required.

• The site is not known to benefit from any flood defences. Given the location of the watercourse against the site, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment. This could be investigated further at site-specific level.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.
• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.
• Safe access and egress will need to be demonstrated; currently some access and egress routes are affected by surface water flooding and fluvial flooding from the 1000year event .
• The peak flows of the unnamed watercourse should be considered when considering drainage.
• Resilience measures will be required if buildings are situated in the flood risk area.
• Assessment for runoff should include allowance for climate change effects.
• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.
• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:
    o Reducing volume and rate of runoff
    o Relocating development to zones with lower flood risk
    o Creating space for flooding.
    o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.
• Onsite attenuation schemes would need to be tested against the hydrographs for any unnamed watercourses to ensure flows are not exacerbated downstream within the catchment.

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EH11 - BISH4: Bishops Stortford: Causeway/Old River Lane				
OSNGR: 548873,221529	Area: 1.373316		Brownfield	
Flood Zone Coverage:	**FZ3b** 0%	**FZ3a** 13.25%	**FZ2** 83.24%	**FZ1** 3.51%

Proposed Development Details:
Mixed use including 100 homes.

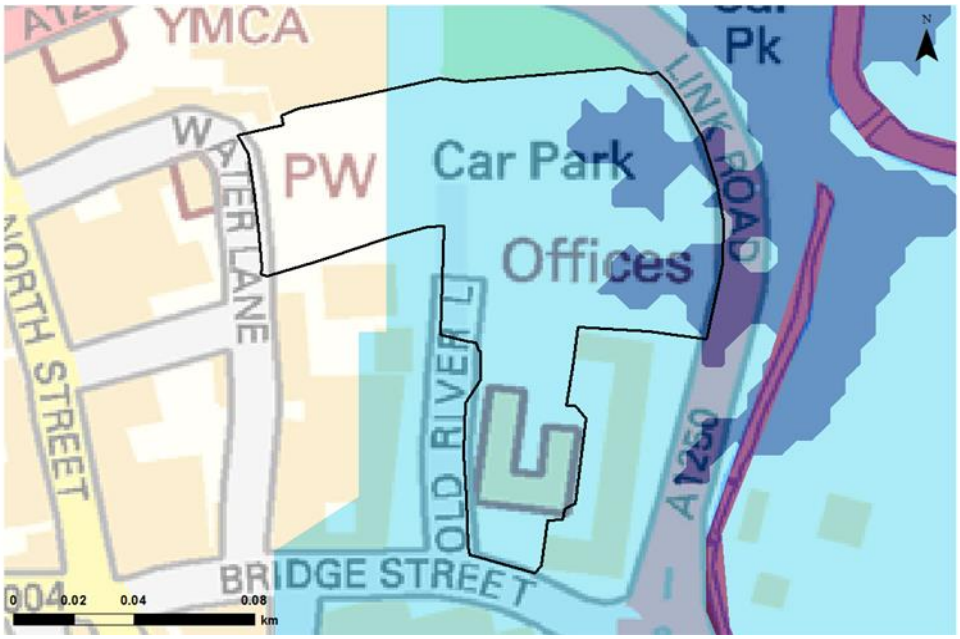
Exception Test Required?
Likely. Buildings used for "dwelling houses" are considered "More Vulnerable" development according to new guidance and over 13% of the site is located in Flood Zone 3a.

The Exception Test is required if:
"More Vulnerable" and "Essential Infrastructure" development is located in FZ3a and for "Highly Vulnerable" development located in FZ2. "Highly Vulnerable" development should not be permitted within FZ3a.

NPPF Guidance:
• For development proposals on sites comprising one hectare or above in Flood Zone 1 the vulnerability of flooding from other sources as well as from river flooding should be incorporated into a FRA.
• The potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off should be considered.
• Developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development and through appropriate sustainable drainage techniques.

Sources of Flood Risk:
A large proportion of the site (over 80%) is situated in Flood Zone 2 and at risk of flooding from the 0.1% AEP event from the River Stort. Surface water flooding affects a similar proportion of the site in the 1,000 year event with the north-eastern corner affected by lower return period events.

Flood Zone Map



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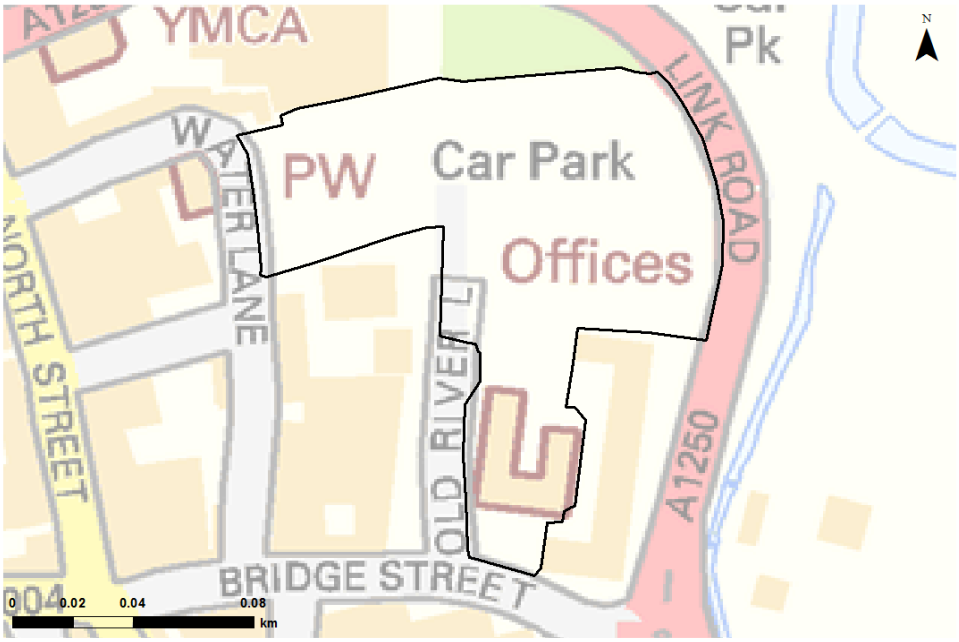
The Flood Zones in this map are derived from existing model results from the Upper & Middle Stort Modelling (Middle Stort reach) provided by Environment Agency. They use the 20-year extent as FZ3b, the 100-year extent as FZ3a, and the 1,000-year extent as FZ2.

Potential Site Allocations
Council boundary
Flood Zone 3b
Flood Zone 3a
Flood Zone 2

Climate Change Map - to be updated when modelling completed



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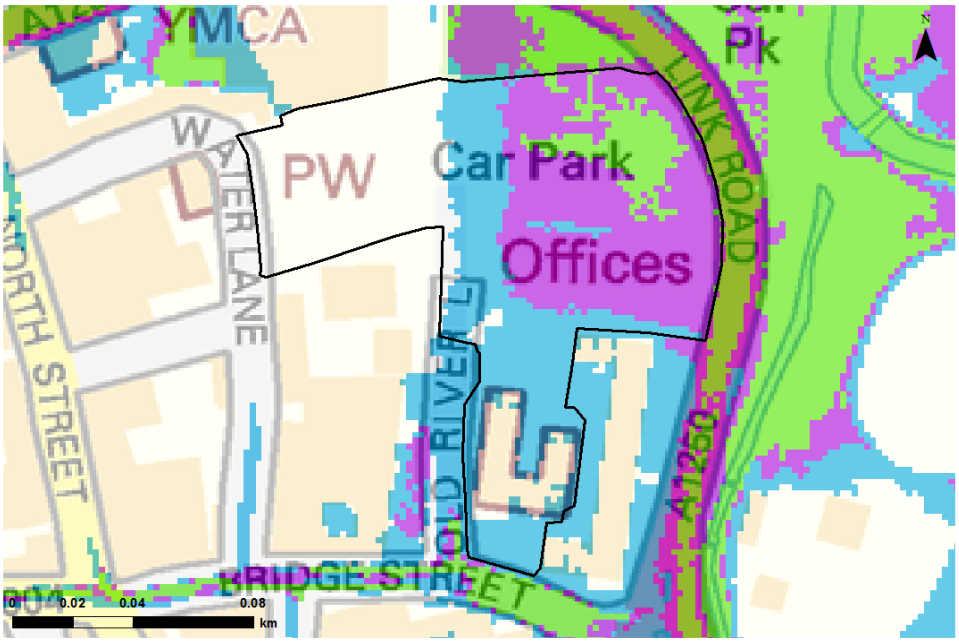
Climate change was modelled for the 2080s epoch, applying the following climate change factors to the 100-year flow: 25%, 35% and 70%.
The map above shows the 100-year + 70% climate change scenario, therefore representing a 'worst case'.

Potential Site Allocations
Flood Zone 3 with Climate Change
Council boundary

Surface Water Map



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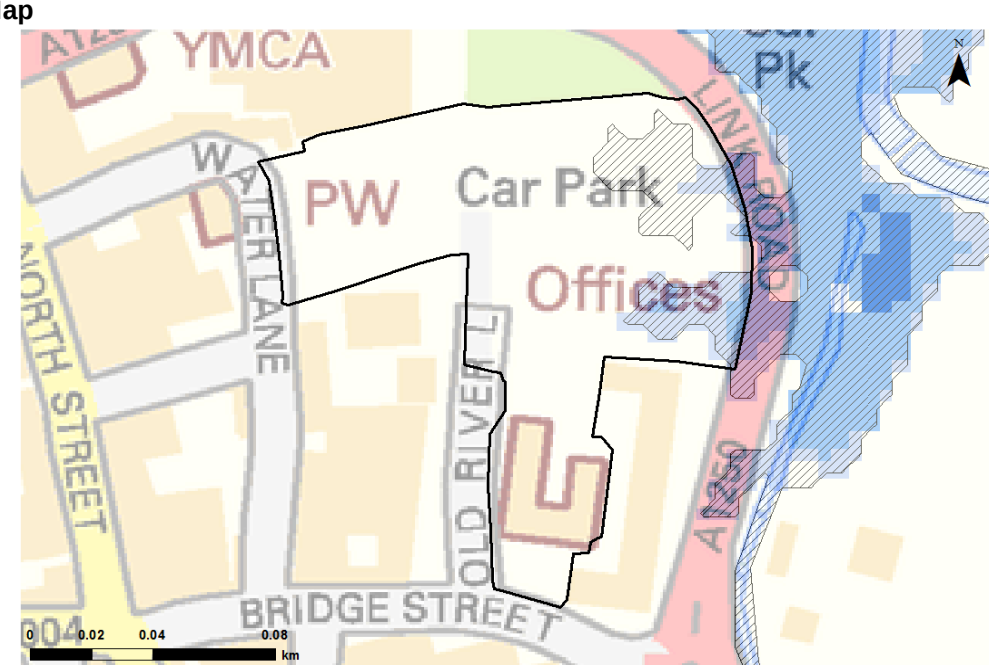
Potential Site Allocations
uFMfSW* 30-year Extent
uFMfSW* 1,000-year Extent
Council boundary
uFMfSW* 100-year Extent

Depth Map



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This depth map is derived from the existing Environment Agency Upper & Middle Stort Modelling (Middle Stort reach)and represents the 100-year undefended event.

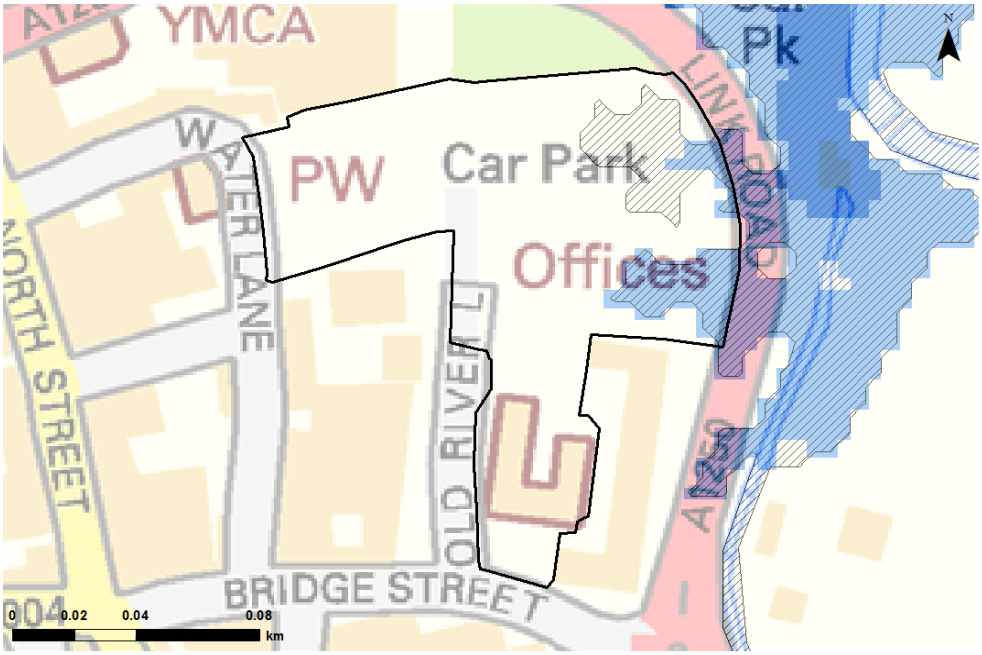
To note: the flood zone covers the full hatched extent; depths in some areas are currently not available and should be confirmed as part of a site-specific assessment.

Potential Site Allocations
Council boundary

Depth (m)

0 - 0.10	0.50 - 1.00	2.00 - 2.50	3.50 - 4.00
0.10 - 0.50	1.00 - 1.50	2.50 - 3.00	>4.00
	1.50 - 2.00	3.00 - 3.50	

Velocity Map



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This velocity map is derived from the existing Environment Agency Upper & Middle Stort Modelling (Middle Stort reach) and represents the 100-year undefended event.

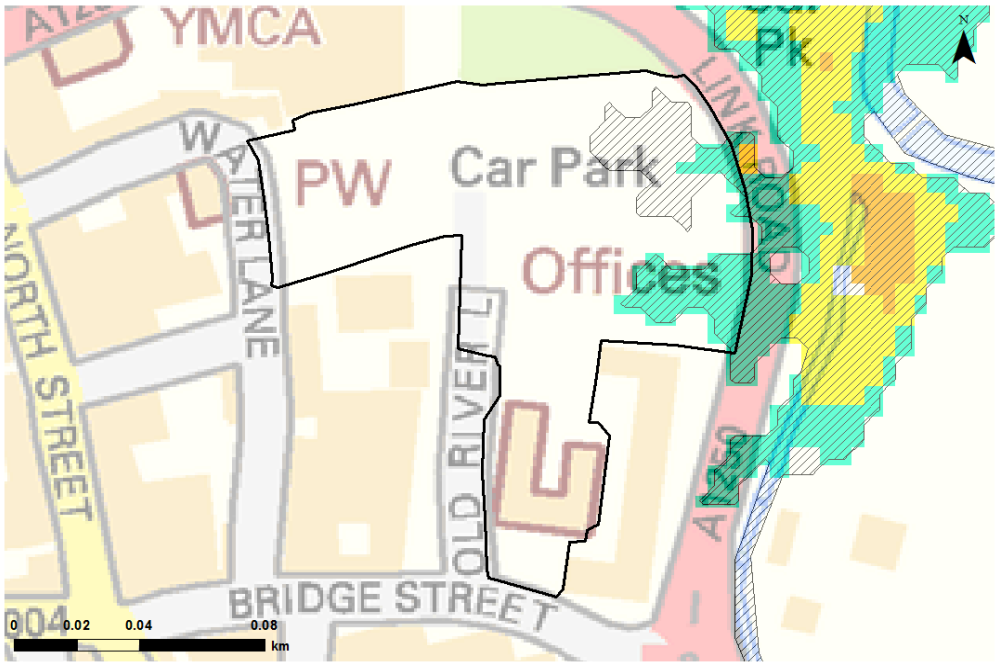
To note: the flood zone covers the full hatched extent; depths in some areas are currently not available and should be confirmed as part of a site-specific assessment .

Potential Site Allocations
Council boundary

Velocity (m/s)

0 - 0.2
0.2 - 0.5
0.5 - 1.0
1.0 - 2.0
> 2.0

Hazard Map



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This hazard map is derived from the existing Environment Agency Upper & Middle Stort Modelling (Middle Stort reach) and represents the 100-year undefended event.

To note: the flood zone covers the full hatched extent; depths in some areas are currently not available and should be confirmed as part of a site-specific assessment.

Potential Site Allocations
Council boundary

Hazard Rating

Very low hazard - caution
Danger for some
Danger for most
Danger for all

SuDS & the development site:		
SuDS Type	Suitability	Comments
Source Control		Most source control techniques are likely to be suitable.
Infiltration		Infiltration may be suitable. Mapping suggests a medium risk of groundwater flooding and underlying soils may be permeable. Further site investigation should be carried out to assess potential for drainage by infiltration. If infiltration is suitable it should be avoided in areas where the depth to the water table is <1m. Additionally, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints given that the site is located with a Source Protection Zone.
Detention		This option may be feasible provided site slopes are < 5% at the location of the detention feature. If the site has groundwater issues or contamination issues in areas of brownfields, a liner will be required.
Filtration		This feature is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required.
Conveyance		All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination or groundwater issues; a liner will be required.

The site is not designated by the Environment Agency as previously being a landfill site.

The site is located with a Source Protection Zone. As such infiltration techniques should only be used where there are suitable levels of treatment although it is possible that infiltration may not be permitted. Proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints.

Drainage strategies should demonstrate that an appropriate number of treatment stages have been delivered. This depends on the factors such as the type of development, primary source of runoff and likelihood of contamination. Guidance should be sought from LLFA and other guidance documents such as the CIRIA SuDS Manual (C753).

Flood Defences:

To the east of the site, along right hand bank of the River Stort (site-side), there are two privately-owned embankments. The 100m long north-eastern defence has a 5% AEP standard of protection and the 340m south-eastern embankment has a 0.1% AEP standard of protection. The condition of these defences range from poor to fair respectively.

Flood Warning:

This site is partly covered by 'The River Stort at Bishops Stortford including Spellbrook' Flood warning Area, and partly covered by 'The River Stort, Stansted Brook and their tributaries from Clavering to Hoddesdon including Stanstead Mountfitchet, Bishops Stortford, Sawbridgeworth and Harlow ' Flood Alert Area (062WAF51Stort).

Access & Egress:
Access and egress from the site can be achieved via a number of roads around the site including the Link Road A1250, Water Lane, Bridge Street and Old River Lane. All of these roads are shown to be affected by surface water and fluvial flooding during the 1,000 year events. Bridge Street and the Link Road are susceptible to surface water flooding in the 30 year event, whereas Link Road is affected by fluvial flooding from the Stort in the 100 year event. Water Lane offers some access/ egress outside of the flood zones/ surface water flood extents.

Climate Change:

Climate change mapping indicates the following impacts for the future:
• Increased storm intensities.
• Increased water extent, depth, velocity and hazard in the watercourse.
• Climate change may also increase the extent, depth and frequency of surface water flooding.

Implications for Development:

• Use of the Sequential Approach is limited due to the majority of the site being covered by the Flood Zones; therefore development placed within the Flood Zone will be required to pass the Exception Test. The site is afforded some protection from flood embankments. These defences have a 5% -0.1% AEP standard of protection; however, there is still a residual risk of flooding should the defence fail (breach). There is also the potential for the defence to overtop in the future due to climate change. Therefore, it is important that the defences in this area continue to be maintained in line with catchment policy and that any development accounts for the potential residual risk.
• Access and egress routes are at risk from fluvial and surface water flooding; in order to pass the Exception Test, development will need to ensure that safe access and egress can be provided for the lifetime of the development. Development should also ensure that there is no increase in flood risk that may exacerbate flooding to access/ egress routes.
• Broadscale assessment of suitable SuDS has indicated a number of different types may be possible; given the size of the site and the proportion of the site at risk from flooding, the type of SuDS system used may be influenced by amount of land available; depending on the system used there may be an impact on the amount of land available for development and the cost of development.
• The site is covered by the Environment Agency's Flood Warning Service. Given the potential access and egress issues, development may need to consider provision of safe refuge in the event of occupiers being unable to evacuate. Given the size and location of the site in the flood zones, it is unlikely the site could be used to implement strategic solutions to alleviate flood risk elsewhere in the catchment. This could be investigated at site-specific assessment stage.

Guidance for Developers:

• At the planning application stage, a site-specific Flood Risk Assessment will be required if any development is located within Flood Zones 2 or 3 or greater than 1ha in size. Other sources of flooding should also be considered.

• Consultation with the Local Authority and the Environment Agency should be undertaken at an early stage, to determine requirements for a FRA and to establish an approach to consider climate change in line with latest guidance.

• Safe access and egress will need to be demonstrated; currently all access and egress routes are affected by fluvial and surface water flooding in the 1,000 year event. Bridge Street and Link Road are affected during lower return periods.

• The peak flows of the River Stort should be considered when considering drainage.

• Resilience measures will be required if buildings are situated in the flood risk area.

• Assessment for runoff should include allowance for climate change effects.

• New or re-development should adopt exemplar source control SuDS techniques to reduce the risk of frequent low impact flooding due to post-development runoff.

• New development must seek opportunities to reduce overall level of flood risk at the site, for example by:

  o Reducing volume and rate of runoff
  o Relocating development to zones with lower flood risk
  o Creating space for flooding.
  o Green infrastructure should be considered within the mitigation measures for surface water runoff from potential development and consider using Flood Zones 2 and 3 as public open space.

• Onsite attenuation schemes would need to be tested against the hydrographs for the River Stort to ensure flows are not exacerbated downstream within the catchment.