

Preliminary flood risk assessment review

Self-assessment form

January 2017

This self-assessment form is provided to enable each lead local flood authority (LLFA) in England to complete the first review of its preliminary assessment report and identification of flood risk areas (FRAs), as required by the Flood Risk Regulations (2009).

Who should complete this self-assessment?

Every LLFA in England should complete parts A, C and D of the self-assessment form and submit it, with the additional information requested in sections C3 and C4, to the appropriate Environment Agency Partnership and Strategic Overview team **no later than 22 June 2017**.

All LLFAs should **read the guidance document 'Preliminary flood risk assessment review: guidance for lead local flood authorities in England'** before completing the self-assessment form.

Part A - LLFA contact information

Name of LLFA	Hertfordshire County Council
Name of LLFA officer submitting the assessment	Charlotte Kemp
Job title	Senior Flood Risk Officer
Telephone number	01992 556791
Email address	charlotte.kemp@hertfordshire.gov.uk
Name of LLFA officer approving the assessment	Andy Hardstaff
Job title	Flood Risk Management Team Leader
Date submitted to Environment Agency	21/06/2017
Link to PFRA report 2011	http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/research/planning/135542.aspx

Part B - to be completed by the Environment Agency

Name of Environment Agency officer receiving the completed assessment	
Job title	
Date assessment received from LLFA	
Date assessment agreed with LLFA	

Part C - LLFA self-assessment

PFRA report section	Activity for PFRA/FRA review	Yes/No	Summary description	Actions planned in response
1. Governance and partnership	1.1 Since publication of the PFRA in 2011, have there been any changes to, or creation of new, risk management authorities (RMAs) with responsibilities in the LLFA area?	No	<p>No new risk management authorities (RMAs) have been created with responsibility in the LLFA area of Hertfordshire.</p> <p>Since the publication of the PFRA in 2011, the Highways Agency has changed their name to Highways England.</p>	<p>None needed.</p> <p>In the current report Highways Agency is referenced, this will need to be changed.</p>
	1.2 Are all roles and responsibilities for collecting and recording flood risk data and information clearly defined, including the respective roles and responsibilities of upper and lower tier authorities and other RMAs where relevant?	Yes	<p>All roles and responsibilities are clearly defined.</p> <p>As part of the Issues and Options consultation on the review of the Local Flood Risk Management Strategy 2017, lower tier authorities gave feedback on the level of resources within lower tier authorities. For example, some lower tier district councils within Hertfordshire are very well resourced to deal with their responsibilities in relation to ordinary watercourses, whilst other districts are not.</p> <p>Further, in the questionnaire sent out to the</p>	<p>Roles will be defined in the new Local Flood Risk Management Strategy (LFRMS), published in 2017.</p>

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			<p>lower tier authorities as part of the Issues and Options Consultation on the LFRMS there were mixed responses on what each RMA was able to do. When lower tier authorities were asked the following: if any assistance was available from each authority in relation to a) preparing for flood events, b) during flood events, and c) to support people after flood events, all authorities (who responded to the questionnaire) would respond during a flood event, but a number would not, or did not have the resource to do a) or c).</p>	
<p>2. Data systems and management</p>	<p>2.1 Do you have an up to date record of relevant sources of flood risk data and information for the LLFA area, including those held by other organisations?</p>	<p>Yes - For this LLFA No - From other organisations</p>	<p>Hertfordshire County Council has an up to date record of surface water flood risk data for the LLFA area. Following a flood event, the LLFA seeks out where flooding has occurred through fire and rescue records, highways reports and local media coverage. Questionnaires are then sent out to residents who could have been affected. This ensures the LLFA gains as full an understanding as possible about a flood event; recording this in a flood incident record.</p> <p>The Hertfordshire LLFA does not have copies of all records held by other organisations. However, we do request records from Water and Sewerage Companies, the Environment Agency etc.</p>	<p>Propose formalised sharing of information with Water and Sewerage Companies and the Environment Agency. This could include monthly updates on flood records, or following a flood event.</p> <p>The Hertfordshire LLFA receives regular reports from Anglian Water Services on their Flood Event Data; this arrangement could also be made with Thames Water Utilities Limited (TWUL). Similar information can currently be requested from TWUL on an event or site basis.</p> <p>The way we work with partners and stakeholders will be detailed as part of the review of the Local Flood Risk Management</p>

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			where needed following flood events and as part of working with RMAs for Section 19 Flood Investigations.	Strategy (2017).
	2.2 Have sources of 'locally agreed surface water information' been established and maintained for the LLFA area and agreed with relevant partners?	Yes	<p>The Risk of Flooding from Surface Water (RoFfSW) maps form the basis for the Hertfordshire LLFA's advice to LPAs.</p> <p>Locally agreed surface water information is included in the Surface Water Management Plans (SWMPs) for Hertfordshire. Each SWMP covers a district/borough of Hertfordshire; six out of the ten districts have completed or near completed SWMPs. For each SWMP, relevant stakeholder meetings are held, and information gathered from all partners.</p> <p>Locally agreed surface water information is also available in the Section 19 Flood Investigation reports undertaken following flood events, which meet the LLFA's criteria for an investigation. Flood Investigation reports are agreed with the relevant partners (RMAs) before publication. Options and Feasibility Studies have also been undertaken and involve relevant partners where needed.</p>	<p>The LLFA is in the process of procuring the final four SWMPs for Hertfordshire. When these are fully completed in 2019, the Hertfordshire LLFA's understanding of local flood risk in these last four districts/boroughs will be significantly increased.</p> <p>Information is continually under review. The RoFfSW maps are the best available information. We will seek to refine this, as and when information becomes available.</p>
	2.3 Are systems in place to collect, record and share data and information for the purpose of assessing flood risk in the LLFA	Yes	How the LLFA works to obtain the information to populate our flood incident record is as follows. This system has been used for the past 3 major flood events in the	None needed.

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	area?		<p>county:</p> <ul style="list-style-type: none"> - Following a flood event, review local media reports, fire and rescue service reports, highways reports, as well as any other communication received by the LLFA. - Request additional information from third parties where needed. - Spatially review the flood reports with the RoFfSW map to capture where else could have flooded. - Write to residents of Hertfordshire who may have suffered flooding to gain a fuller understanding of the flood event. - Review to determine which flood incidents that meet the criteria for a Section 19 Flood Investigation. - Due to the availability of resources, Hertfordshire County Council determined criteria to prioritise those incidents. <p>Systems for collecting, recording and sharing data include GIS, Microsoft Excel as well as reports available in either Microsoft Word or PDFs.</p> <p>Hertfordshire LLFA collects and makes data available to other RMAs, as appropriate.</p>	
	2.4 Are systems in place to assure the quality and security of data	Yes	All data is stored securely on Hertfordshire County Council servers. These servers are	None needed.

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	and information recorded for the purpose of assessing flood risk in the LLFA area?		<p>frequently backed up. No information is stored on personal laptops. Where information is needed to be stored on external hard drives e.g. hydraulic models, three separate copies are made.</p> <p>The flood incident record is associated with the address points or OS Master Map data; no personal information given to us by residents or information which would be covered under data protection is stored.</p> <p>All Contractors working on Hertfordshire County Councils behalf have to sign a data sharing agreement. Contractors also sign a Public Sector Mapping Agreement (PSMA) when using any data which is covered under this.</p>	
	2.5 Do you understand the condition and performance of the public, third party and private assets in your register in terms of flood risk?	Yes/No	<p>The Register of Structures and Features has not been formally updated since the publication of the first Local Flood Risk Management Strategy in 2013.</p> <p>The condition of those structures and features that are on the register are known; however, not all structures and features known in Hertfordshire are populated within it.</p>	The process of defining if an asset (structure and/or feature) should be put on a register is being determined as part of the review of the Local Flood Risk Management Strategy 2017. Hertfordshire County Council as LLFA is in the process of commissioning and implementing software which will enable better recording of assets in Hertfordshire.
3. Past floods since Dec 2011 only)	3.1 Have any flood events occurred since publication of the original PFRA report in December 2011 that have added to or	Yes	<p>As requested in the guidance notes, this box has not been populated.</p> <p>Details of relevant floods have been</p>	None needed.

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Information on past floods since 2011 is required for reporting to the European Commission	changed your understanding of significant flood risk in the LLFA area? See the guidance document on which floods to report.		provided by updating Annex 1 Past Floods of the original PFRA report to include relevant floods since 2011. Information from the updated Annex 1 will be used for reporting to the European Commission.	
	3.2 Has your current understanding of significant flood risk in the LLFA area changed as a result of the consequences of floods that have occurred since 2011? How?	Yes	<p>As requested in the guidance notes, the below statement has been included here, and copied into the relevant section of the PFRA Addendum at the end of this document.</p> <p>The Hertfordshire LLFA's understanding of significant flood risk in Hertfordshire has changed as a result of the consequences of the floods that have occurred since 2011. Four major flood events have occurred in Hertfordshire since 2011; these being 1) Winter 2013-2014, encompassing February 2014, 2) July 2015, 3) June 2016 and 4) September 2016. Flooding in the three most recent events can be attributed to high intensity summer storms, considered to be exceptional. Whilst flooding in February 2014 was the result of a long period of wet weather, creating antecedent conditions which meant that an unexceptional storm caused flooding.</p> <p>The LLFA has learnt that overall, the RoFfSW map predicts flooding well. This has been confirmed where known flood incidents correspond with the RoFfSW map.</p>	None needed.

PFRA report section	Activity for PFRA/FRA review	Yes/No	Summary description	Actions planned in response
			<p>However, there are some areas of the RoFfSW map which either under or over predict flooding, or incorrectly predict flooding. With both of these points in mind, flooding that has occurred in Hertfordshire, has meant that the Hertfordshire LLFA's understanding of the RoFfSW map has increased significantly, for example:</p> <ol style="list-style-type: none"> 1. Data: For more rural areas of Hertfordshire, the DTM used in the uFMfSW and subsequent RoFfSW use NEXTMap data. Whilst the use of NEXTMap data is not an issue in unpopulated areas, it can be an issue where a rural flowpath is flowing into an urban one, or where part of an urban area is covered by NEXTMap data. One example of this is Robbery Bottom Lane, Welwyn, where the discrepancy between the NEXTMap data and topographical surveyed points was +/- 1-2m. 2. The storm duration over which the JFlow+ model and the subsequent RoFfSW map results have been obtained. As the maximum extent over three different storm durations was used, we can't be sure where areas shown as at flood risk on the RoFfSW are under or over predicting. A few areas have shown discrepancies with the RoFfSW map. This also means that the worst case scenario is not necessarily the conditions under which the worst case scenario occurs, e.g. one 6 hr storm and one 3 hr storm could create different extents. 	

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			<p>The RoFfSW maps were compared to the flood maps produced for the Surface Water Management Plans (SWMPs). This showed that overall the SWMP maps are similar to the RoFfSW maps, with some differences. These being where the SWMP maps have improved understanding, such as when the uFMfSW DTM did not represent a substantial road cutting and embankment from a recent bypass road, which when included in the model, changed the surface water floodmap. Overall, however, the RoFfSW map and the SWMP hotspot floodmaps are broadly similar.</p> <p>All of the above has increased the Hertfordshire LLFA's understanding of flood risk in the county.</p>	
<p>4. Future flood information</p> <p>Information on future floods is required for reporting to the European Commission</p>	<p>4.1 Have you created or received new information on potential future floods that has added to or changed your understanding of significant flood risk in the LLFA area since publication of your original PFRA report in 2011?</p>	<p>Yes</p>	<p>As requested in the guidance notes, this box has not been populated.</p> <p>Details have been provided by updating Annex 2 Future Floods of the original PFRA report to include relevant new information since 2011.</p> <p>Information from the updated Annex 2 will be used for reporting to the European Commission.</p>	<p>None needed.</p>
	<p>4.2 Have you created or received new information to improve the understanding of the future impact</p>	<p>Yes</p>	<p>Since 2011, a number of studies have been undertaken across Hertfordshire that have included hydraulic modelling. For some of</p>	<p>No urgent action needed, though the LLFA will continue to develop and further its understanding of the future impact of climate</p>

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	of climate change on flood risk in the LLFA area?		<p>these sites climate change scenarios were run; including either a 30% or 40% climate change allowance (changed in accordance with the updated climate change guidance). Annex 2 details sites in Hertfordshire which have been hydraulically modelled to understand future flood risk, including climate change in the rainfall probabilities run.</p> <p>For the LLFA's statutory consultee role in planning applications, account was also taken of the national guidance on climate change uplift.</p> <p>This has helped with the LLFA's understanding of the impact of climate change on already at risk sites.</p>	change on flood risk in Hertfordshire.
	4.3 Have you created or received new information on long term developments to improve your understanding of flood risk in the LLFA area?	Yes	<p>As statutory consultee on major planning applications or development on known flood risk sites; the Sustainable Drainage team of the LLFA are continually informed on the development of land in Hertfordshire.</p> <p>The Hertfordshire LLFA is consulted on the Local Planning Authorities (LPAs) Strategic Flood Risk Assessment (SFRAs) undertaken as part of the LPAs Local Plans. Local Plans set out a vision and a framework for the future development of the area, addressing needs and opportunities in relation to housing, the economy,</p>	None needed.

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			<p>community facilities and infrastructure – as well as a basis for safeguarding the environment, adapting to climate change and securing good design. An SFRA supports the LPAs Local Plan; to help make planning decisions. Planning applicants will refer to a LPAs SFRA when carrying out their site specific flood risk assessments. The Hertfordshire LLFA comments on each LPAs SFRA.</p> <p>Information on long term developments to improve the Hertfordshire LLFA's understanding of local flood risk is a continual process.</p>	
	<p>4.4 Has your understanding of flood risk in the LLFA area changed since 2011 as a result of new information on the potential consequences of future floods, the impact of climate change or long term developments? How?</p>	<p>Yes</p>	<p>As requested in the guidance notes, this box has been completed, with a copy of the Hertfordshire LLFAs statement included in the relevant section of the PFRA Addendum, at the end of this document.</p> <p>The Hertfordshire LLFA's understanding of flood risk in Hertfordshire has changed since 2011. Much knowledge has been gained on the potential consequences of future floods, in addition to the impact of climate change and long term developments.</p> <p>With the overall aim of increasing the LLFA's understanding of future flood risk in Hertfordshire, the LLFA undertakes four main types of studies:</p>	<p>None needed.</p>

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			<p>1) Section 19 Flood Investigations. These investigations complete the LLFA's statutory role under Section 19 Local authorities: investigations under the Flood and Water Management Act 2010 " On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate: (a) which risk management authorities have relevant flood risk management functions, and (b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.</p> <p>2) Initial Assessments. These are undertaken in partnership with the Environment Agency, using their framework for Initial Assessments. An Initial Assessment collates together information on flood risk for a site; the assessment determines whether a scheme could be viable for a site, to decide if the site could be taken forward for further work.</p> <p>3) Options and Feasibility Studies/Hydraulic Modelling Studies. These are undertaken to better understand known historical flood risk at a site. Hydraulic modelling determines the flood mechanisms at a site, with Contractors assessing options to alleviate flooding. The ultimate aim of these studies is to produce an Outline Business Case for submission to the Environment Agency to compete for Flood and Coastal Erosion Risk</p>	

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			<p>Management Grant in Aid (FCERM GiA) funding.</p> <p>4) Surface Water Management Plans (SWMPs). SWMPs are an early stage assessment of flood risk in Hertfordshire, to get a strategic understanding of flood risk across the county. SWMPs are undertaken at the district scale; there are ten districts in Hertfordshire. When the Hertfordshire LLFA undertakes a SWMP, hotspot analysis and prioritisation is undertaken, with five sites (hotspots) being selected from each district for a more detailed assessment. SWMPs allow the LLFA to achieve a high level strategic overview of flood risk across each district.</p> <p>The LLFA also undertakes partnership working with other LLFAs, other RMAs and other parts of the County Council organisation; these studies can encompass any aspect of flood risk.</p> <p>Completed studies or near completed studies that the LLFA has undertaken include:</p> <ul style="list-style-type: none"> - 12 Section 19 Flood Investigations. 10 published and 6 unpublished. - Travellers Lane, Hatfield, Hydraulic Modelling Study. 	

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PFRA report section	Activity for PFRA/FRA review	Yes/No	Summary description	Actions planned in response
			<ul style="list-style-type: none"> - Harefield Road, Rickmansworth Asset and Hydraulic Modelling Study. - Kimpton Hydraulic Modelling Study. - Little Wymondley Hydraulic Modelling Study. - Robbery Bottom Lane, Welwyn Options and Feasibility Study. - Redbourn Options and Feasibility Study. - Long Marston Hydraulic Modelling Study. - Dacorum Borough Surface Water Management Plan; including hydraulic modelling of four hotspots. - North Hertfordshire District Surface Water Management Plan; including hydraulic modelling of six hotspots. - East Hertfordshire District Surface Water Management Plan; including hydraulic modelling on five hotspots. - Broxbourne Borough Surface Water Management Plan; including hydraulic modelling on five hotspots. - Marshmoor Lane / Foxes Lane, Welham Green, Watercourse Improvement and Partnership Study. <p>Current and future programmed studies for this year (2017) include:</p> <ul style="list-style-type: none"> - 18 Detailed Section 19 Flood Investigations from June 2016 and 	

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			<p>September 2016 flooding across the county.</p> <ul style="list-style-type: none"> - Darkes Lane, Potters Bar, Hydraulic Modelling Study. - Datchworth, Hydraulic Modelling Study. - Knebworth Options and Feasibility Study. - Pix Brook, Letchworth Garden City, Hydraulic Modelling Study. <p>The first three types of studies undertaken by the Hertfordshire LLFA involve the LLFA looking at previous historical floods and being guided by them on where we prioritise our work. This ensures we understand the future flood risk at those already at risk sites. The final type of study, SWMPs, build on looking at those already at risk sites; but also seek to review future potential at risk sites, which may or may not have flooded previously. The SWMPs provide a first stage look at identifying flood risk areas (called hotspots) in each district of Hertfordshire. A SWMP outlines the preferred surface water management strategy within a district/borough, and as such is required to look at future flood risk for that district/borough. SWMPs also identify any at risk sites which may have been allocated for future development, by reviewing the Local Planning Authorities (LPAs) Local Plan.</p>	

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			<p>All these studies increase the LLFA's understanding of flood risk by:</p> <ul style="list-style-type: none"> - Confirming the flood mechanism for an at risk site, by analysing Hertfordshire residents flooding questionnaires and on site surveys. - Confirming the flood mechanism for an at risk site by undertaking hydraulic modelling. Including more detail in the modelling than that in the RoFfSW modelling. Such as topographical survey of kerb heights, spot heights, fences, properties boundaries and property threshold levels. As well as the inclusion of surface water sewer networks (including surveying and tracing where needed), ordinary watercourses and Main Rivers, where appropriate. - Running different scenarios through the hydraulic model including for example, the do minimum and do nothing situation, as well as climate change analysis, to better understand how flood risk could change at an at risk site. - Displaying spatially areas at risk of surface water flooding; including modelled/mapped and point data (e.g. the flood incident record). - Understanding of any options to mitigate flood risk and how they could be implemented in an at risk area. Including analysis of cost-benefit and if that option 	

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			<p>would attract central government funding.</p> <ul style="list-style-type: none"> - Understanding if property resilience measures are the most appropriate option for a flood risk site. <p>In terms of long term development, the SuDS team of the Hertfordshire LLFA follow national guidance, and also have their own guidance (based on published information e.g. CIRIA (construction industry research and information association) manuals) on how developers should implement SuDS in Hertfordshire. The team provide recommendations to the LPA on reviewing major planning applications and for those applications on flood risk sites. Whilst the final decision rests with the LPA, the SuDS team follow this strict guidance to help ensure new development does not increase flood risk in Hertfordshire.</p> <p>Future floods, the impact of climate change and long term development all have the potential to increase flood risk in Hertfordshire. Our understanding, brought about through undertaking multiple studies has increased significantly since 2011. These studies, together with future ones, will ensure that the Hertfordshire LLFA will be able do as much as possible, within the bounds of available resources, to help</p>	

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PFRA report section	Activity for PFRA/FRA review	Yes/No	Summary description	Actions planned in response
			mitigate this impact.	
5. Identification of Flood Risk Areas for 2nd planning cycle Identified FRAs are required for reporting to the European Commission	5.1 Are the indicative FRAs an appropriate representation of significant surface water flood risk in your LLFA area?	n/a	There are no indicative FRAs within Hertfordshire, except those areas from the Method 1: Cluster Method and Method: 2 Communities at Risk, which cross a very small amount into the Hertfordshire County boundary.	It is proposed that the areas be removed from where they are within the Hertfordshire County boundary.
	5.2 Do the consequences of flooding from other local sources , i.e. groundwater or ordinary watercourses, or from combined multiple sources , indicate any other areas of significant risk?	No	<p>There are other known areas at risk of other local sources of flooding in Hertfordshire.</p> <p>In the case of groundwater, these at risk areas are very difficult to predict; unless groundwater flooding has previously occurred and it is thought to occur again in the future, for example, the village of Kimpton.</p> <p>Flooding from ordinary watercourses is often combined with surface water flooding. Areas affected by ordinary watercourse flooding are predominantly known in Hertfordshire; especially where they have flooded previously, for example, the village of Little Wymondley.</p> <p>Combined multiple sources of flooding are also known; if they are not necessarily</p>	None needed.

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			<p>combined at the point of flood, it is that one source of flooding is impacted by another, which could cause flooding. For example, the town of Watford, where surface water is impeded from draining into the Main River at a number of locations.</p> <p>Whilst there are other known sources of local flooding in Hertfordshire, and flooding from combined multiple sources, it is not believed that any of these areas are at significant enough risk to be determined as FRAs.</p>	
	5.3 Has your PFRA review identified any other information which indicates other areas of significant risk?	No	This PFRA review has not identified any other information which indicates other areas of significant risk.	None needed.
	5.4 On the basis of the national evidence provided and your review, do you agree with the indicative FRAs for your area?	No	<p>As requested in the guidance notes, this box has not been populated.</p> <p>Details have been provided by updating Annex 3 of the original PFRA report to include amendments to the indicative FRAs bordering Hertfordshire.</p>	<p>Whilst there are no real indicative FRAs within Hertfordshire. Some areas identified in the Method 1: Cluster Method and Method 2: Communities at risk, which are primarily in other areas, cross into the Hertfordshire County boundary. The Hertfordshire LLFA proposes to have these areas clipped to the Hertfordshire County boundary, so that they are omitted from Hertfordshire.</p> <p>On review of the shapefile: "PFRA_Method1_1KMBlueSquares" it is noted that some individual squares are nearby to each other; though do not meet the criteria for</p>

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				identifying an indicative Flood Risk Area (iFRA). All of these locations are identified within the Surface Water Management Plans (SWMPs. It is therefore determined that this finding is nothing exceptional, as they are identified in the Hertfordshire LLFAs SWMPs.
	5.5 On the basis of local evidence and your review, are you amending or identifying any additional FRAs for your area?	Yes	As requested in the guidance notes, this box has not been populated. No additional FRAs are proposed. Annex 3 of the original PFRA report has been updated with amendments.	The Hertfordshire LLFA is not recommending any additional FRAs, but would like to amend boundaries; please see Annex 3.
6. Updating the original preliminary assessment report using the template addendum (see also Part D) Updates are required for reporting to the European Commission	6.1 Have you completed an addendum to update your preliminary assessment report?	Yes	As requested in the guidance notes, this box has not been populated. The PFRA Addendum has been completed at the end of this document.	None needed.

Part D Template for addendum to update the original Preliminary Flood Risk Assessment report

ADDENDUM

Update to the preliminary flood risk assessment report for Hertfordshire County Council LLFA

The preliminary flood risk assessment (PFRA) and flood risk areas (FRAs) for Hertfordshire County Council LLFA were reviewed during 2017, using all relevant current flood risk data and information, and agreed with the Environment Agency on 22 December 2017.

Changes to the assessment of risk since the preliminary assessment report was published in 2011 are described in the statements in this addendum.

The annexes to the preliminary assessment report have been reviewed and updated to show relevant new information since 2011.

Past flood risk

The Hertfordshire LLFA's understanding of significant flood risk in Hertfordshire has changed as a result of the consequences of the floods that have occurred since 2011. Four major flood events have occurred in Hertfordshire since 2011; these being 1) Winter 2013-2014, encompassing February 2014, 2) July 2015, 3) June 2016 and 4) September 2016. Flooding in the three most recent events can be attributed to high intensity summer storms, considered to be exceptional. Whilst flooding in February 2014 was the result of a long period of wet weather, creating antecedent conditions which meant that an unexceptional storm caused flooding.

The LLFA has learnt that overall, the RoFfSW map predicts flooding well. This has been confirmed where known flood incidents correspond with the RoFfSW map. However, there are some areas of the RoFfSW map which either under or over predict flooding, or incorrectly predict flooding. With both of these points in mind, flooding that has occurred in Hertfordshire, has meant that the Hertfordshire LLFA's understanding of the RoFfSW map has increased significantly, for example:

1. Data: For more rural areas of Hertfordshire, the DTM used in the uFMfSW and subsequent RoFfSW use NEXTMap data. Whilst the use of NEXTMap data is not an issue in unpopulated areas, it can be an issue where a rural flowpath is flowing into an urban one, or where part of an urban area is covered by NEXTMap data. One example of this is Robbery Bottom Lane, Welwyn, where the discrepancy between the NEXTMap data and topographical surveyed points was +/- 1-2m.
2. The storm duration over which the JFlow+ model and the subsequent RoFfSW map results have been obtained. As the maximum extent over three different storm durations was used, we can't be sure where areas shown as at flood risk on the RoFfSW are under or over predicting. A few areas have shown discrepancies with the RoFfSW map. This also means that the worst case scenario is not necessarily the conditions under which the worst case scenario occurs, e.g. one 6 hr storm and one 3 hr storm could create different extents.

The RoFfSW maps were compared to the flood maps produced for the Surface Water Management Plans (SWMPs). This showed that overall the SWMP maps are similar to the RoFfSW maps, with some differences. These being where the SWMP maps have improved understanding, such as when the uFMfSW DTM did not represent a substantial road cutting and embankment from a recent bypass road, which when included in the model, changed the surface water floodmap. Overall, however, the RoFfSW map and the SWMP hotspot floodmaps are broadly similar.

All of the above has increased the Hertfordshire LLFA's understanding of flood risk in the county.

Future flood risk

The Hertfordshire LLFA's understanding of flood risk in Hertfordshire has changed since 2011. Much knowledge has been gained on the potential consequences of future floods, in addition to the impact of climate change and long term developments.

With the overall aim of increasing the LLFA's understanding of future flood risk in Hertfordshire, the LLFA undertakes four main types of studies: 1) Section 19 Flood Investigations, 2) Initial Assessments, 3) Options and Feasibility Studies/Hydraulic Modelling Studies, 4) Surface Water Management Plans. The LLFA also undertakes partnership working with other LLFAs, other RMAs and other parts of the County Council organisation; these studies can encompass any aspect of flood risk.

Completed studies or near completed studies that the LLFA has undertaken include:

- 12 Section 19 Flood Investigations. 10 published and 6 unpublished.
- Travellers Lane, Hatfield, Hydraulic Modelling Study.
- Harefield Road, Rickmansworth Asset and Hydraulic Modelling Study.
- Kimpton Hydraulic Modelling Study.
- Little Wymondley Hydraulic Modelling Study.
- Robbery Bottom Lane, Welwyn Options and Feasibility Study.
- Redbourn Options and Feasibility Study.
- Long Marston Hydraulic Modelling Study.
- Dacorum Borough Surface Water Management Plan; including hydraulic modelling of four hotspots.
- North Hertfordshire District Surface Water Management Plan; including hydraulic modelling of six hotspots.
- East Hertfordshire District Surface Water Management Plan; including hydraulic modelling on five hotspots.
- Broxbourne Borough Surface Water Management Plan; including hydraulic modelling on five hotspots.
- Marshmoor Lane / Foxes Lane, Welham Green, Watercourse Improvement and Partnership Study.

Current and future programmed studies for this year (2017) include:

- 18 Detailed Section 19 Flood Investigations from June 2016 and September 2016 flooding across the county.
- Darkes Lane, Potters Bar, Hydraulic Modelling Study.
- Datchworth, Hydraulic Modelling Study.
- Knebworth Options and Feasibility Study.
- Pix Brook, Letchworth Garden City, Hydraulic Modelling Study.

The first three types of studies undertaken by the Hertfordshire LLFA involve the LLFA looking at previous historical floods and being guided by them on where we prioritise our work. This ensures we understand the future flood risk at those already at risk sites. The final type of study, SWMPs, build on looking at those already at risk sites; but also seek to review future potential at risk sites, which may or may not have flooded previously. The SWMPs provide a first stage look at identifying flood risk areas (called hotspots) in each district of Hertfordshire. A SWMP outlines the preferred surface water management strategy within a district/borough, and as such is required to look at future flood risk for that district/borough. SWMPs also identify any at risk sites which may have been allocated for future development, by reviewing the Local Planning Authorities (LPAs) Local Plan.

All these studies increase the LLFA's understanding of flood risk by:

- Confirming the flood mechanism for an at risk site, by analysing Hertfordshire residents flooding questionnaires and on site surveys.
- Confirming the flood mechanism for an at risk site by undertaking hydraulic modelling. Including more detail in the modelling than that in the RoFfSW modelling. Such as topographical survey of kerb heights, spot heights, fences, properties boundaries and property threshold levels. As well as the inclusion of surface water sewer networks (including surveying and tracing where needed), ordinary watercourses and Main Rivers, where appropriate.
- Running different scenarios through the hydraulic model including for example, the do minimum and do nothing situation, as well as climate change analysis, to better understand how flood risk could change at an at risk site.
- Displaying spatially areas at risk of surface water flooding; including modelled/mapped and point data (e.g. the flood incident record).
- Understanding of any options to mitigate flood risk and how they could be implemented in an at risk area. Including analysis of cost-benefit and if that option would attract central government funding.
- Understanding if property resilience measures are the most appropriate option for a flood risk site.

In terms of long term development, the SuDS team of the Hertfordshire LLFA follow national guidance, and also have their own guidance (based on published information e.g. Ciria manuals) on how developers should implement SuDS in Hertfordshire. The team provide recommendations to the LPA on reviewing major planning applications and for those applications on flood risk sites. Whilst the final decision rests with the LPA, the SuDS team follow this strict guidance to help ensure new development does not increase flood risk in Hertfordshire.

Future floods, the impact of climate change and long term development all have the potential to increase flood risk in Hertfordshire. Our understanding, brought about through undertaking multiple studies has increased significantly since 2011. These studies, together with future ones, will ensure that the Hertfordshire LLFA will be able do as much as possible, within the bounds of available resources, to help mitigate this impact.

Flood risk areas (FRAs)

No FRAs have been identified within Hertfordshire, for the purposes of the Flood Risk Regulations (2009) 2nd planning cycle.

Other changes

The structure of the Hertfordshire LLFA's flood risk management team has changed greatly since 2011. In 2011, there was only one member of the team; the team has now expanded to eight, covering the roles shown in the organogram below.

