

Torbay Council

Preliminary Flood Risk Assessment Report

Final Report

June 2011



Table of Contents

1.0	Executive Summary	4
2.0	Introduction	6
2.1	Preliminary Flood Risk Assessment	6
2.2	Scope of Preliminary Flood Risk Assessment Report	7
2.3	Aims and Objectives	7
2.4	Study Area of Torbay Council	8
3.0	Lead Local Flood Authority Responsibility	9
3.1	Introduction	9
3.2	Coordination of Flood Risk Management	9
3.3	Stakeholder Engagement	10
3.4	Public Engagement	11
3.5	Further Responsibilities	11
4.0	Methodology and Data Review	13
4.1	Introduction	13
4.2	Methodology	13
4.3	Assessing Future Flood Risk	15
4.4	Identifying Flood Risk Areas	16
4.5	Quality Assurance, Security and Data Restrictions	16
5.0	Historic Flood Risk in Torbay	18
5.1	Overview of Historic Flooding in Torbay	18
5.2	Surface Water Flooding	18
5.3	Groundwater Flooding	19
5.4	Sewer Flooding	19
5.5	Ordinary Watercourse Flooding	19
5.6	Interaction with Main Rivers and the Sea	20
5.7	Significant Harmful Consequences	20
5.8	Adopted Method of Defining Locally Significant Harmful Consequences	21
5.9	Local and National Thresholds	22
6.0	Future Flood Risk	23
6.1	Future Floods and their Consequences	23
6.2	Surface Water Flooding	23
6.3	Groundwater Flooding	23
6.4	Locally Agreed Surface Water Information	24
6.5	Effects of Climate Change and Long Term Development	24
7.0	Flood Risk Areas	27
7.1	Overview	27
7.2	Local Flood Risk Areas and the Identification of New National Indicative Flood Risk Areas	27
8.0	Next Steps	29
8.1	Future Data Management Arrangements	29
8.2	Local Strategy for Flood Risk Management	29
8.3	Review and Updating Flood Data and Modelling	29
8.4	Scrutiny and Review Procedures	29
8.5	Local Authority Review	30
8.6	Environment Agency Review	30

References	31
Abbreviations	32

Annex 1	Records of past floods and their significant consequences (Preliminary Assessment Spreadsheet)
Annex 2	Records of future floods and their significant consequences (Preliminary Assessment Spreadsheet)
Annex 3	Records of Flood Risk Areas and their rationale (Preliminary Assessment Spreadsheet)
Annex 4	Preliminary Flood Risk Assessment Checklist

Figures

Figure 1	Geographical Extent of Study Area
Figure 2	Torbay Flood Group Structure
Figure 3	GIS Point Data
Figure 4	Surface Water Flooding Incidents
Figure 5	Blue Squares showing areas above the nationally set flood risk threshold
Figure 6	Cluster Areas and rankings of local areas of flood risk
Figure 7	Areas Susceptible to Groundwater Flooding
Figure 8	Torquay Surface Water Flooding
Figure 9	Paignton Surface Water Flooding
Figure 10	Brixham Surface Water Flooding
Figure 11	Clennon Valley Surface Water Flooding

Tables

Table 1	Elements of Work required under the Flood Risk Regulations	7
Table 2	Data Availability from Partner Organisations	14
Table 3	Data Availability from Environment Agency	15
Table 4	Key Flood Risk Indicators	16
Table 5	Number of Locally Significant Flood Events within Torbay for a range of threshold levels	22
Table 6	Summary of Torbay’s Significant Flood Events	22
Table 7	Number of People at Risk from Surface water Flooding Based on “Blue Square” Mapping	28

1.0 Executive Summary

This report has been prepared to assist Torbay Council meet their duties to manage local flood risk and deliver the requirements of the Flood Risk Regulations 2009. Torbay Council is a Unitary authority covering the towns of Torquay, Paignton and Brixham and under the Flood Risk Regulations is defined as a Lead Local Flood Authority. The Preliminary Flood Risk Assessment (PFRA), comprising this document and the supporting spreadsheets and GIS layers represents the first stage of the requirements of the Regulations.

The PFRA process is aimed at providing a high level overview of flood risk from local flood sources, including surface water, groundwater and ordinary watercourses. As a Lead Local Flood Authority Torbay Council must submit its PFRA to the Environment Agency for review by 22nd June 2011. The methodology for producing this PFRA has been based on the Environment Agency's Final PFRA Guidance and Defra's Guidance on selecting national Indicative Flood Risk Areas, both of which were published in December 2010.

In order to develop a clear overall understanding of the flood risk across Torbay, flood risk data and records of historic flooding have been collected from a number of different sources including Torbay Council's flooding reports, the Environment Agency, South West Water, emergency services and other risk management authorities.

The assessment of past flood risk in Torbay has involved collecting information relating to over 100 past flooding events. These have been analysed, extracting information relating to surface water, ordinary watercourse and groundwater flood events. A local threshold level was set to determine the past events considered to have had local significant harmful consequences. This was set at more than 30 properties suffering internal flooding during any one event, due to the requirements to submit above threshold events in Annex 1 Preliminary Assessment Spreadsheet at a scale considered significant to report to Europe.

However, it is still noted that many flood events in Torbay fall below the threshold for inclusion within Annex 1 have had major impacts on people's lives and the economy. These are still considered to have been major incidents and locally significant and will therefore still be considered when assessing flood risk across Torbay. In addition to this, comprehensive details on flood extents and consequences were largely unavailable from many records, also limiting the number of past events to report in Annex 1.

Future flood risk has been assessed by using nationally set thresholds. The Environment Agency has used a national methodology, which has been set out by Defra, to identify national indicative Flood Risk Areas across England. Of the ten national Indicative Flood Risk Areas that have been identified, none are located within Torbay's administrative area.

However, it must be emphasised that there is a high risk of flooding from local sources across Torbay, particularly from surface water. Based on national surface water modelling approximately 5,100 residential properties are estimated to be at risk

from surface water flooding to a depth of greater than 0.3m during a rainfall event with a 1 in 200 (0.5%) annual chance of occurring.

2.0 Introduction

2.1 Preliminary Flood Risk Assessment

This document reports the findings of research undertaken by Torbay Council towards the preparation of a Preliminary Flood Risk Assessment (PFRA) for its administrative area.

The main drivers behind this research and preparation of the PFRA report are two sets of new legislation: the Flood Risk Regulations, which came into force on 10th December 2009; and the Floods and Water Management Act which gained Royal Assent on 8th April 2010. Under these pieces of legislation, all Unitary Authorities including Torbay Council, and in two tier systems all County Councils are designated as a Lead Local Flood Authority and have formally been allocated a number of key responsibilities with respect to local flood management. A full description of these responsibilities is provided in Chapter 2.

The purpose of the Flood Risk Regulations is to transpose the EC Floods Directive into domestic law in England and Wales and to implement its provisions. In particular it places duties on the Environment Agency and Lead Local Flood Authorities to prepare a number of documents including:

- Preliminary Flood Risk Assessments.
- Flood hazard and flood risk maps.
- Flood Risk Management Plans.

Table 1 shows the elements of work required from Torbay Council under the Flood Risk Regulations 2009, along with the timescales of their respective delivery. The first two elements of work highlighted below, are covered by the preparation of this PFRA report. The further elements of work are not required to be undertaken by Torbay Council as there are no areas within Torbay that meet the national criteria of 30,000 people at risk in order to be classified as a National Flood Risk Area. Any data gathered as part of this report, however, will be used to support and inform the preparation of Torbay Council's Local Strategy for Flood Risk Management, which will be the next stage of legislation to progress. Section 4.3 of this report explains the difference between the national Flood Risk Area thresholds used and those used to determine the locally significant past flood events in Torbay.

Table 1
Elements of Work required under the Flood Risk Regulations 2009

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

It should be noted that in June 2017 the whole cycle identified in Table 1 above will be repeated.

2.2 Scope of Preliminary Flood Risk Assessment Report

The PFRA exercise is a high level screening process, to gather local and national information in order to describe both the probability and harmful consequences of past and potential future flooding. As a Lead Local Flood Authority, Torbay Council is responsible for assessing potential flood risk from:

- Surface water;
- Ordinary watercourses; and
- Groundwater

Flooding associated with the sea, main river and reservoirs is the responsibility of the Environment Agency and therefore does not need to be considered by Lead Local Flood Authorities as part of the PFRA, unless it is considered to interact with and affect flooding from the local sources listed above.

2.3 Aims and Objectives

The aim of this report is to review all of the existing flood risk information available from the Lead Local Flood Authority and partner organisations, consisting of data on local historic flood events, flood probabilities and harmful consequences of flood events on the local economy, environment and cultural heritage. This data collection exercise will then enable national surface water flood risk models to be verified and to ultimately identify areas of flood risk within the Lead Local Flood Authority area, whilst supporting the local strategy for flood risk management.

The key objectives can be summarised as follows:

- Identify relevant partner organisations involved in future assessment of flood risk and summarise means of future and ongoing stakeholder engagement.
- Describe arrangements for partnership and collaboration for ongoing collection, assessment and storage of flood risk data and information.
- Provide a summary of the systems used for data sharing and storing, and provision for quality assurance, security and data licensing arrangements.
- Summarise the methodology adopted for the PFRA with respect to data sources, availability and review procedures.
- Assess historic flood events within the study area from local sources of flooding (includes flooding from surface water, groundwater and ordinary watercourses) and the consequences and impacts of these events.
- Establish an evidence base of historic flood risk information, which will be built up on in the future and used to support and inform the preparation of Torbay Council's Local Flood Risk Strategy.
- Assess the potential harmful consequences of future flood events within the study area.
- Review the provisional national assessment of indicative Flood Risk Areas provided by the Environment Agency and provide explanation and justification for any amendments required to the Flood Risk Areas.

2.4 Study Area of Torbay Council

The study area for this PFRA is defined by the administrative boundary of Torbay Council. This includes the towns of Torquay, Paignton and Brixham and is located on the South Devon coast. The geographical extent of the study area is illustrated in Figure 1.

The administrative area of Torbay Council covers approximately 63km².

Geographically, Torbay is located within the County of Devon, however politically Torbay is a Unitary Authority and as such Torbay Council is responsible for the local flood risk management responsibilities within this area. Devon County Council is responsible for the local flood risk management responsibilities within the area of the County surrounding Torbay. The PFRA for Torbay falls within the region of the South West river basin district (Water Framework Directive) and the South Devon Catchment Flood Management Plan.

The study area is currently served by one water company, namely South West Water and one Environment Agency region (South West Region). The Devon and Cornwall Regional Flood and Coastal Committee covers the Torbay area and Torbay Council have one representative on the committee.

3.0 Lead Local Flood Authority Responsibilities

3.1 Introduction

The preparation of a PFRA is just one of several responsibilities of Lead Local Flood Authorities under the new legislation. This section provides a brief overview of other responsibilities Torbay Council are obliged to fulfil under their role as a Lead Local Flood Authority.

Much of the local knowledge and technical expertise necessary for Torbay Council to fulfil their duties as Lead Local Flood Authority lies within the Councils Engineering Section and other partner organisations. It is therefore crucial that Torbay Council works alongside these organisations as they undertake their responsibilities to ensure effective and consistent management of local flood risk throughout the area and to contribute to the provision of a coordinated and holistic approach to flood risk management across the Torbay catchment area.

3.2 Coordination of Flood Risk Management

As a Lead Local Flood Authority, it is the role of Torbay Council to forge effective partnerships with the Environment Agency and South West Water, as well as other key stakeholders and risk management authorities. The importance of working together is highlighted in the Flood Risk Regulations 2009, Regulation 35 and The Flood and Water Management Act 2010, Section 12, which both require relevant authorities to cooperate with one another.

Since the major flooding within Torbay in 1999 which resulted in the death of one resident due to drowning, Torbay Council has organised an officer led Flood Steering Group which meets four times a year. As well as Council officers representing Engineering, Highways, Strategic Planning, Planning, Harbours and Emergency Planning the group includes the Cabinet member for Environment, the member who represents Torbay on the Regional Flood and Coastal Committee, the Environment Agency, South West Water and Torbay Development Agency. This group provides an overarching lead on flood risk management within Torbay.

In addition to the Torbay Flood Steering Group, an officer from Torbay Council also attends the Devon Strategic Drainage Group meetings and the South West Lead Local Flood Authority meetings.

An organogram of the overall flood group structure is provided in Figure 2.

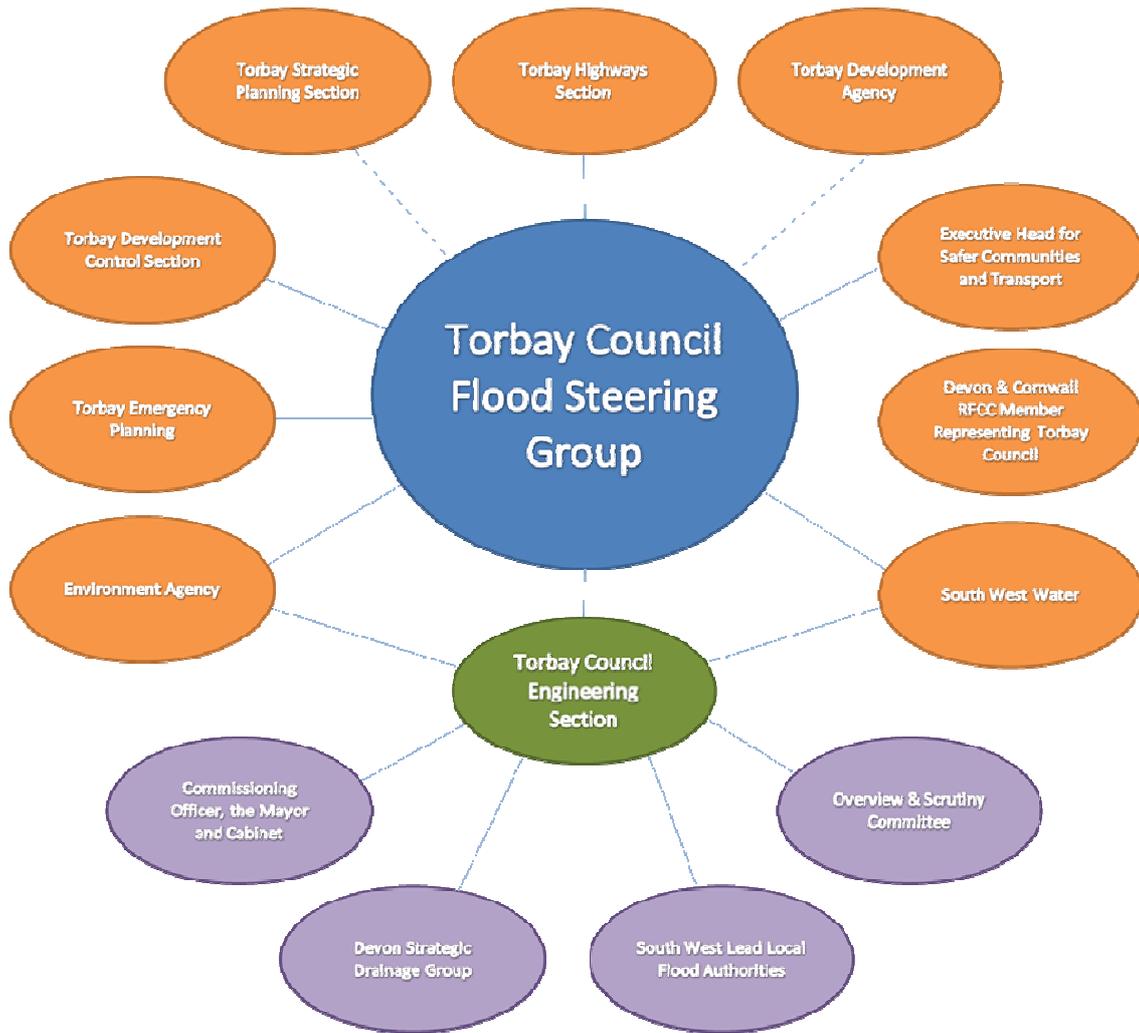


Figure 2 - Torbay Flood Group Structure

3.3 Stakeholder Engagement

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

- Torbay Council
- Environment Agency
- South West Water
- Network Rail
- Devon and Somerset Fire and Rescue

It is important to note that we have communicated with and collated from various department leads within Torbay Council, including Emergency Planning, Strategic Planning, Highways and Parks.

3.4 Public Engagement

It is recognised that members of the public may also have valuable information to contribute to the PFRA and to local flood risk management. Stakeholder engagement can afford significant benefits to local flood risk management including building trust, gaining access to additional local knowledge and increasing the chance of stakeholder acceptance of options and decisions proposed in future flood risk management plans.

It is important to undertake some public engagement when formulating local flood risk management plans (for the flood risk area within Torbay) as this will help to inform future levels of public engagement. Torbay Council therefore propose to follow the guidelines outlined in the Environment Agency’s “Building Trust with Communities” document which provides a useful process of how to communicate risk including the causes, probability and consequences to the general public and professional forums such as a local resilience forums.

3.5 Further Responsibilities

Aside from forging partnerships and coordinating and leading on local flood management, there are a number of other key responsibilities that have arisen for Lead Local Flood Authorities from the Flood and Water Management Act 2010 and the Flood Risk Regulations 2009. These responsibilities include:

- Investigating flood incidents – Lead Local Flood Authorities have a duty to investigate and record details of significant flood events within their area. This duty includes identifying which authorities have flood risk management functions and what they have done or intend to do with respect to the incident, notifying risk management authorities where necessary and publishing the results of any investigations carried out. Further information in respect of this duty is provided in Chapter 7.
- Asset Register – Lead Local Flood Authorities also have a duty to maintain a register of structures or features which are considered to have an effect on flood risk, including details of ownership and condition as a minimum. The register must be available for inspection and the Secretary of State will be able to make regulations about the contents of the register and records.
- SuDS Approving Body – Lead Local Flood Authorities are designated as the SuDS Approving Body (SAB) for any new drainage system, and therefore must approve, adopt and maintain any new sustainable drainage systems (SuDS) within their area.
- Local Strategy for Flood Risk Management – Lead Local Flood Authorities are required to develop, maintain, apply and monitor a local strategy for flood risk management in its area. The local strategy will build on information such as national risk assessments and will use consistent risk based approaches across different local authority areas and catchments.

- Work Powers – Lead Local Flood Authorities have powers to undertake works manage flood risk from surface run-off and groundwater, consistent with the local risk management strategy for the area.
- Designation Powers – Lead Local Flood Authorities, as well as district councils and the Environment Agency have powers to designate structures and features that affect flooding or coastal erosion in order to safeguard assets that are relied upon for flood or coastal erosion risk management

4.0 Methodology and Data Review

4.1 Introduction

The PFRA is a high level screening exercise used to identify areas where the risk of flooding is considered to be significant and warrants further examination and management through the production of flood risk and flood hazard maps and flood risk management plans.

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

4.2 Methodology

The following organisations were identified and contacted to share data for the preparation of the PFRA: South West Water, the Environment Agency, Devon and Somerset Fire and Rescue, Network Rail and the Torbay Harbour Master.

There are various published flood risk management reports, including Torbay Council's Strategic Flood Risk Assessment reports, South Devon Catchment Flood Management Plan, South West River Basin Management Plan, South Devon and Dorset Shoreline Management Plan and Multi Agency Flood Plans. These have been interrogated in order to retrieve information on current and past flood risk in the Torbay area.

Map Info GIS has been used in order to map the local flood risk using national and local data sets from local flood risk stakeholders.

Partner organisations have been contacted and relevant flood risk data requested in order to assist with the PFRA process. Table 2 and 3 detail the availability of the data and the information gathered from local flood risk stakeholders, in addition to any issues with access and the collation of this data.

Table 2**Data Availability from Partner Organisations**

Partner Organisation and Available Data	Availability, Limitations, Storage and Data Licensing Issues
Torbay Council – Details held on local flood events consisting of reports of flooding of properties and roads from main rivers, ordinary watercourses, sewers, highway drains, surface water run-off and groundwater.	Data available for over 20 years however detailed flood reports have only been prepared since 1999.
South West Water – SWW have supplied Torbay Council with the DG5 flooding records identifying both internal and external flooding problems.	Data only to be shared at a postcode level.
Network Rail – The local network rail office has an informal flood plan which is updated yearly with information on areas of rail track prone to flooding. The majority of flood risk is from fluvial and tidal sources.	Local office unable to supply data for inclusion within the PFRA at present.
Torbay Council Harbour Master – As the flood risk at Torquay, Paignton and Brixham harbours is predominantly from tidal sources data is not relevant for inclusion within PFRA.	No significant additional flood risk issues above those already identified by Torbay Council relevant for this PFRA report.
Natural England – Hold data sets for assessing environmental impacts, such as location of SSSI's, Special Protection Areas and Special Areas of Conservation.	Data layers available and downloaded from Natural England website.
Devon and Somerset Fire and Rescue – Data consists of GIS point data of recorded flood incidents.	Data available for last two years. Also specific data relating to the larger storm events experienced in Torbay over the last twenty years has previously been obtained in the form of log sheets.

Table 3**Data Available for the Environment Agency**

Environment Agency Data Layer
Historic Flooding Map – Extent of past flood events from rivers, sea and groundwater
Flood Event Outlines on NFCDD – Flood event outline covering records from all sources of flooding.
Flood Event Maps – Historic records of flood events from paper records, now digitised.
Flood Reconnaissance Information System (FRIS) – Information collected after flood events, detailing affected properties and the extent of flooding.
Detailed River Network (DRN) – This can display the classification of rivers to identify main rivers and ordinary watercourses.
National Receptor Dataset (NRD) – Includes social, economic, environmental and cultural receptors that could be at risk of flooding, such as residential properties.
Flood Map – Extent of flooding from sea and river catchments over 3km ² . Including: <ul style="list-style-type: none"> • Flood defences • Flood storage areas • Areas benefiting from flood defences • Flood Zone 3: Flood extent from rivers having a 1% annual probability of occurring and from coastal waters having a 0.5% annual probability. • Flood Zone 2: Flood extent from rivers and coastal waters having a 0.1% annual probability of occurring or largest historic event if a greater extent.
Areas Susceptible to Surface Water Flooding (AStSWF) – Three nationally modelled outline layers. Namely: <ul style="list-style-type: none"> • Areas more susceptible • Areas with intermediate susceptibility • Areas less susceptible
Flood Map for Surface Water (FMfSW) – 2 nd generation version of the modelled surface water flood maps. These are categorised as follows: <ul style="list-style-type: none"> • 200 year rainfall event with predicted depth of flooding greater than 0.1m • 200 year rainfall event with predicted depth of flooding greater than 0.3m • 30 year rainfall event with predicted depth of flooding greater than 0.1m • 30 year rainfall event with predicted depth of flooding greater than 0.3m
Areas Susceptible to groundwater flooding (AStGWF) – 1km grid squares showing the risk of groundwater flooding
Paper Records – Photos, flood reports, newspaper reports and scheme reports available, some of this is digitally available.

4.3 Assessing Future Flood Risk

The identification of flood risk areas through the PFRA should also take into account future floods, defined as any flood that could potentially occur in the future. This definition includes predicted floods extrapolated from current conditions in addition to those with an allowance for climate change. The assessment of future flood risk will primarily rely on a technical review of the Environment Agency's Flood Map for Surface water which has been circulated to all Lead Local Flood Authorities. The

Flood Map for Surface Water uses a numerical hydraulic model to predict the extent of flood risk from two rainfall events (1 in 30 annual chance and 1 in 200 annual chance).

4.4 Identifying Flood Risk Areas

Information regarding historic and future flood risk will be used to formally identify flood risk areas. To achieve this, the flood risk indicators will be used to determine the impacts of flooding on human health, economic activity, cultural heritage and the environment. The use of flood risk indicators helps to develop understanding of the impacts and consequences of flooding. Details of the key flood risk indicators used are summarised in Table 4.

Table 4

Key Flood Risk Indicators

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

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

This process has been followed in order to assess the flood risk in Torbay and as a result there are no indicative flood risk areas identified within Torbay.

4.5 Quality Assurance, Security and Data Restrictions

Data sets used in the production of this PFRA were subjected to quality assurance measures in order to highlight any errors, which have been corrected. Data sharing agreements already exist between Torbay Council and the partner organisations. These agreements have been followed when presenting information within the PFRA report. Any data supplied by the Environment Agency and used within this report has been reproduced in accordance with the data licences supplied with each dataset. Data standards for documentation that will be submitted to the Environment Agency have been followed in accordance with Annex 5 of the PFRA guidance document.

A number of issues arose during the data collection process and these are identified in this chapter to provide transparency with respect to the methodology. By flagging up the issues identified in the data collection phase it is hoped this could serve as a catalyst to improve the collection of flood risk data going forward.

The issues that arose during the data collection process are described below:

Historically, the lack of consistent flood data recording systems across the various organisations has resulted in major inconsistencies in the recording of flood event data. This has resulted in incomplete or sometimes nonexistent flood record datasets. Some of the datasets collated are not exhaustive and it is considered that they are unlikely to represent the complete flood risk issues in a particular area. It should be noted that the recording of flooding data has improved significantly following the completion of the Integrated Urban Drainage Management Pilot Study for Torbay.

It is crucial for flood risk assessments that data collected over long periods of time should be retained in order to improve confidence in predicting longer return period events. Therefore Torbay Council will ensure that data sets collected from now on will be retained for long periods, giving a larger range of data and increasing the certainty in assessments in the future.

5.0 Historic Flood Risk in Torbay

5.1 Overview of Historic Flooding in Torbay

Historically, there have been many flooding incidents recorded across Torbay from surface water and ordinary watercourses, with main river and tidal influences often contributing. The development and urbanisation of Torbay over the years has contributed towards the increased flood risk, where land management changes are increasing surface run-off rather than retaining water. Past flood records from local partners have been collated and analysed. However, records that fall into the following criteria have been discounted:

- Records where the main source is from a main river or tidal sources and there is no interaction with surface run-off or the ordinary watercourses.
- Records with uncertainties or without enough detail.
- Records from locations with improved drainage systems or recently constructed flood defences.

Figure 3 highlights all of the GIS point data gathered of past flood events from Torbay Council flood records, the Environment Agency FRIS database, South West Water DG5 records and Devon and Somerset Fire and Rescue.

5.2 Surface Water Flooding

Surface water flooding occurs when heavy rainfall exceeds the capacity of the local drainage systems or the permeability of the ground surface or soils, resulting in water flowing across the ground or ponding. The majority of the surface water flooding incident records have been acquired through Torbay Council's historic flooding reports and the Environment Agency FRIS database. Supporting information was also obtained from the local water company, South West Water, of areas known to have flooded due to hydraulic overload of the public sewer system. This indicates areas particularly prone to surface water flooding and has helped to verify historic records. Devon and Somerset Fire and Rescue Service data has been analysed and this has also been used in the verification of historic flooding data. Other sources of information that have been used to identify and verify historic surface water flooding include the South Devon CFMP and Torbay Council's Level 1 and Level 2 Strategic Flood Risk Assessments.

The majority of significant events reported in the Annex 1 spreadsheet are from surface water run-off. Many of the surface water flooding records although not considered to be nationally significant are still considered to be significant at a local scale. The records collated show localised areas across Torbay that have suffered from surface water flooding over the past twenty years, with all the towns that comprise Torbay having been affected. Although these are not reported in detail as part of this PFRA they will support research for Torbay's Local Strategy for Flood Risk Management.

Figure 4 highlights the extent of surface water flooding incidents (including ditch water, sewers, highways and ordinary watercourses) across Torbay including a range

of different sized storm events. Although this data is not exhaustive, it does represent the spatial pattern of flooding problems across Torbay.

5.3 Groundwater Flooding

Groundwater flooding occurs as a result of water rising up from an underlying aquifer or from water from abnormal springs. This tends to occur after long periods of sustained rainfall, and the areas at most risk are often low-lying where the water table is likely to be at a shallow depth. Groundwater flooding is known to occur in areas underlain by major aquifers, although increasingly it is also being associated with more localised floodplain sands and gravels.

The geotechnical framework of the Torbay area is complex, not only in terms of the lithological variations that abound, particularly in the Devonian strata, but also because of the complexity of the geological structure. Most of Torbay is underlain by a mixture of limestone, sandstone, breccias, mudstones, shales and slates however in the low-lying coastal areas and old river valleys relatively recent (in geological terms) alluvial and marine deposits are found.

There is limited detailed information available on flood risk from groundwater within the historical flooding records. Although groundwater may have been a contributing factor to a number of flooding incidents, there are no significant incidents reported in Annex 1 from groundwater flooding. It should be noted, however, that a number of events included in Annex 1 identify groundwater contributing as an additional source of flooding.

5.4 Sewer Flooding

Sewer flooding is often caused by excess water entering the drainage system. DG5 registers from South West Water were analysed to investigate the occurrence of sewer flooding incidents across Torbay. It was found that there were a total of 83 sewer flooding events that have been recorded by South West Water over the past fifteen years. However due to the data sharing agreements these events have not been published within this report. There is however a number of significant flood events across Torbay contained within Annex 1 that identifies flooding from the sewer system as an additional source.

5.5 Ordinary Watercourse Flooding

The historic records available on ordinary watercourse flooding incidents are from the Torbay Council historic flooding records and the Environment Agency FRIS database. It is not often clear from the records analysed whether the main source of flooding is from a main river or ordinary watercourse, however any records with a lack of detail on the source of flooding have been omitted. Ordinary watercourse appears as the cause of flooding in localised areas of Torbay and the flood water often interacts with surface water run-off. Ordinary watercourse is identified in Annex 1 as the main source of flooding for a number of significant historic events.

It should be noted that a number of critical ordinary watercourse in Torbay were enmained on 1st April 2006. Historic flooding data however will identify the source of

flooding associated with these main rivers as ordinary watercourses flooding prior to 2006.

5.6 Interaction with Main Rivers and the Sea

There is a large amount of data available from the Environment Agency regarding flooding from the sea and data is available for flooding from main rivers within Torbay since their enmainment in 2006. A number of the historic flood event records collated have some interaction with either main rivers or the sea.

There are several significant major historic floods that have occurred in Torbay over the last 50 years however as a result of these floods being caused by overtopping of coastal defences they have not been included in this report. It should be noted that surface water flooding is exacerbated in the low lying areas around the coast in Torquay, Paignton and Brixham, during high tidal cycles when the capacity of the surface water outfalls discharging to coastal waters is heavily restricted.

5.7 Significant Harmful Consequences

Annex 1 reports on past flood events from local sources, surface water and ordinary watercourses considered to have had significant harmful consequences to human health, the economy, the environment or cultural heritage. These events reported in Annex 1 are those that exceed the local significant threshold, set by Torbay Council as part of the PFRA process. However, it should be noted that any flood event that occurs will be significant on some scale to the local community and have a significant impact on people's lives and the economy.

National guidance issued by Defra sets thresholds for defining national Indicative Flood Risk Areas, where the current flood risk is significant. However, no guidance has been issued for defining locally significant harmful consequences for the assessment of past flood events and therefore it is up to each Lead Local Flood Authority to set its own definition. It has been suggested by the Environment Agency that the threshold should be an order of magnitude below the significance criteria for determining the national Indicative Flood Risk Areas. They also recommend that as a minimum, it should involve flooding of a number of properties, on more than one occasion.

A definition of locally significant flood events that was agreed at the South West Lead Local Flood Authorities, Flood Risk Managers Group is identified below.

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

- Caused internal flooding to five or more residential properties. Or
- Flooded two or more business premises, or
- Flooded one or more items of critical infrastructure, or
- Caused a transport link to be totally impassable for a significant period.

5.8 Adopted Method for Defining Locally Significant Harmful Consequences

In order to identify locally significant past flood events in Torbay the methodology and significance criteria outlined in the Environment Agency guidance has been followed as closely as possible. Data collated for the PFRA exercise in the form of spreadsheets and GIS data points and polygons have been analysed and any records with gaps, uncertainties, lack of detail or areas with improved flood defences now in place have been discounted. The locations where flood prevention now exists have been ignored, unless the residual risk is still considered to be significant.

Due to the inaccuracies associated with the historic flooding records and the level of protection provided by flood alleviation/improvement works that have been undertaken by Torbay Council, South West Water, the Environment Agency and third parties (e.g. flood storage solutions provided by developers) over the years only the flooding history since 1991 has been assessed in detail. This process resulted in 17 past local flood event records in Torbay. In addition to this, comprehensive details on flood extents and consequences were largely unavailable from many records, also limiting the number of past event records considered reliable and to therefore be included. Although historic flooding event data prior to 1991 has not been included within this report the records have been maintained as they provide a useful background to the susceptibility of flooding within areas of Torbay.

The requirements for populating the Preliminary Assessment Spreadsheet on past flood events contained in Annex 1 should be significant enough for reporting to Europe and that the threshold level should be determined by each individual Lead Local Flood Authority. Therefore, a high threshold has been set by Torbay Council to determine the locally significant events although many smaller events are still considered to have had significant impacts on Torbay's economy and people's lives. These smaller events will not qualify for inclusion in the Annex 1 spreadsheet however they will form part of Torbay's Local Strategy for Flood Risk Management, where the flood risk in those areas will be investigated and assessed more thoroughly.

It appears that a reasonable threshold for Torbay would be 30 or more properties affected by internal flooding in any one event should be included in the Annex 1 submission, giving 7 locally significant past flood events. Table 5 shows the results of the range of threshold levels considered for the 17 events. Table 6 provides a brief summary of these seven events that will be included within the PFRA Annex 1 spreadsheet.

Table 5**Number of locally significant flood events within Torbay for a range of threshold levels**

Significant Threshold Level – Number of Properties Flooded	Number of Locally Significant Flood Events
5 or more	17
10 or more	12
20 or more	10
30 or more	7
50 or more	3
100 or more	1

Table 6**Summary of Torbay’s Significant Flood Events**

Event Number	Location	Date	Properties Flooded	Main Source	Secondary Source
1	Torquay & Paignton	24/10/99	162	Surface run-off	Ordinary watercourse
2	Torquay	23/6/91	74	Surface run-off	Combined sewers
3	Torquay & Paignton	20/8/07	64	Surface run-off	Ordinary watercourse
4	Torquay & Paignton	22/9/92	46	Surface run-off	Ordinary watercourse
5	Torquay	19/8/00	41	Surface run-off	Combined sewers
6	Brixham	24/12/99	37	Ordinary watercourse (now designated as main river)	Surface run-off
7	Torquay	29/5/99	30	Surface run-off	Combined sewers

5.9 Local and National Thresholds

The threshold of 30 properties affected is for the assessment of past local flood events and should not be confused with the national thresholds set for the assessment of future flood risk. The locally significant past flood event threshold has been set locally by Torbay Council as part of this PFRA exercise. The national Indicative Flood Risk Areas are discussed in detail in Chapter 7 and the blue square and cluster areas referred to are shown in Figures 5 and 6 respectively.

6.0 Future Flood Risk

6.1 Future Floods and Their Consequences

The identification of the flood risk areas through the PFRA exercise should also take into consideration future floods, which are defined as any flood that could potentially occur in the future. The assessment of future flood risk will primarily rely on a technical review of the Environment Agency's Flood Map for Surface Water (FMfSW) which has been recently been issued to all Lead Local Flood Authorities. The FMfSW uses a numerical hydraulic model to predict the extent of flood risk from two rainfall events having return periods of 1 in 30 and 1 in 200 years.

The following factors were considered when assessing future flood risk across the Torbay study area; topography, location of ordinary watercourses, location of plains that retain water, characteristics of the watercourses, effectiveness of any flood alleviation works that have recently been constructed, location of populated areas, areas in which economic activity is concentrated, the current and predicted impact of any long term developments that might affect the occurrence or significance of flooding, such as proposals for future development.

6.2 Surface Water Flooding

The Environment Agency has produced a national assessment of surface water flood risk in the form of two national mapping datasets. The first generation national mapping, areas Susceptible to Surface Water Flooding (AStSWF), contains three susceptibility bandings for a rainfall event with a 1 in 200 chance of occurring. The national methodology has since been updated to produce the FMfSW, a revised model containing flood extents for two rainfall events, 1 in 30 and 1 in 200 chance of occurring and two flood depth bandings, greater than 0.1m and greater than 0.3m.

A comparison of the historic surface water flooding incidents and the two sets of national surface water flood mapping has been undertaken. The results of this comparison are that the FMfSW mapping most accurately identifies the locations of historic surface water flood risk within Torbay and therefore the data contained within this dataset will be used within this report. Using this datasets, the number of properties at risk of surface water flooding within Torbay has been estimated. For a rainfall event with a 1 in 200 annual chance of occurring, 13,600 properties are at risk from flooding to a depth of 0.1m and 6,500 properties are at risk from flooding to a depth of 0.3m. Of these properties at risk over 80% are residential properties. Further details of the potential harmful consequences of future flooding are included in Annex 2 of the Preliminary Assessment Spreadsheet.

6.3 Groundwater Flooding

There is little information available on future flood risk to groundwater. Figure 7 shows the Environment Agency's dataset, Areas Susceptible to Groundwater Flooding (AStGWF) for the Torbay area. This highlights 1km grid squares with different levels of risk to groundwater flooding. Details of properties at risk in Torbay according to AStGWF is given in Annex 2, the areas showing the highest

susceptibility in Torbay broadly tie in with historical flooding data, highway maintenances and drainage problem areas.

6.4 Locally Agreed Surface Water Information

In order to determine the locally agreed surface water information, the surface water data that best represents local conditions has been reviewed and agreed with the Environment Agency. This process has involved scrutinising the surface water flood maps, AStSWF and FMfSW by comparing the modelled areas with historic information and the surface water flood risk modelling works undertaken by Torbay Council for the major flood risk areas within Torbay as part of the Level 2 Strategic Flood Risk Assessment.

After analysing the data, in general the FMfSW flood mapping gives a good representation of the historic flooding and gives a reasonable representation of the surface water flood risk identified within the surface water modelling works undertaken by Torbay Council. As the Torbay Council modelling works were only undertaken for the major flood risk areas, it is proposed, that as part of the local strategy works the complete Torbay catchment area will be modelled in order to update the locally agreed surface water flood risk data. As part of these works the local differences previously identified between the Torbay Council modelling works and the FMfSW modelling will be investigated in detail.

Originally, it was proposed that the modelling works undertaken as part of Torbay Council's Level 2 Strategic Flood Risk Assessment would be used in the production of this PFRA, however this has not been possible as the data was not in a readily derivable form. Figures 8, 9, 10 and 11 highlight the results of the surface water flood risk modelling works for the major flood risk areas undertaken by Torbay Council as part of the Level 2 Strategic Flood Risk Assessment Report.

The flood risk mapping work produced as part of the Level 2 Strategic Flood Risk Assessment Report will continue to be used to guide future development and planning decisions whereas the FMfSW data is being used at a strategic level for some national consistency in assessing the number of properties at risk. As mentioned earlier, as part of the local strategy, Torbay Council proposes to undertake more detailed surface water modelling works over the entire Torbay catchment area in order to improve the locally agreed surface water data. In addition a more detailed assessment of the location and numbers of properties at risk from surface water flooding will be undertaken. The result of this work will be included within the next review of the PFRA report which will be completed by June 2017.

6.5 Effects of Climate Change and Long Term Development

The Evidence

There is clear scientific evidence that global climate change is happening now. It cannot be ignored.

Over the past century around the UK we have seen sea level rise and more of our winter rain falling in intense wet spells. Seasonal rainfall is highly variable. It seems

to have decreased in summer and increased in winter, although winter amounts changed little in the last 50 years. Some of the changes might reflect natural variation; however the broad trends are in line with projections from climate models.

Greenhouse gas (GHG) levels in the atmosphere are likely to cause higher winter rainfall in the future. Past GHG emissions mean some climate change is inevitable in the next 20-30 years. Lower emissions could reduce the amount of climate change further into the future, but changes are still projected at least as far ahead as the 2080s.

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

Key Projections for South West River Basin District

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

- Winter precipitation increase of around 17% (very likely to be between 4 and 38%)
- Precipitation on the wettest day in winter up by around 12% (very unlikely to be more than 24%)
- Relative sea level at Plymouth very likely to be up between 12 and 42cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- Peak river flows in a typical catchment likely to increase between 11 and 21%

Increases in rain are projected to be greater near the coast than inland.

Implications for Flood Risk

Climate changes can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

Wetter winters and more of this rain falling in wet spells may increase river flooding. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers, so we need to be prepared for the unexpected.

Rising sea or river levels may increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses.

There is a risk of flooding from groundwater in the district. Recharge may increase in wetter winters, or decrease in drier summers.

Where appropriate, we need local studies to understand climate impacts in detail, including effects from other factors like land use. Sustainable development and drainage will help us adapt to climate change and manage the risk of damaging floods in future.

Adapting to Change

Past emissions means some climate change is inevitable. It is essential we respond by planning ahead. We can prepare by understanding our current and future vulnerability to flooding, developing plans for increased resilience and building the capacity to adapt. Regular review and adherence to these plans is key to achieving long-term, sustainable benefits.

Although the broad climate change picture is clear, we have to make local decisions uncertainty. We will therefore consider a range of measures and retain flexibility to adapt. This approach, embodied within flood risk appraisal guidance, will help ensure that we do not increase our vulnerability to flooding.

Long Term Developments

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

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

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

7.0 Flood Risk Areas

7.1 Overview

In order to ensure a consistent national approach, Defra have identified significance criteria and thresholds to be used for defining national Indicative Flood Risk Areas. Guidance on applying these thresholds has been released in Defra’s guidance document, *Selecting and reviewing Flood Risk Areas for local sources of flooding*. In this guidance document, Defra have outlined agreed key risk indicators and threshold values which must be used to determine the national Flood Risk Areas.

The methodology is based on using national flood risk information to identify 1km squares where local flood risk exceeds a defined threshold. Where there are 5 or more adjacent squares, a cluster area is formed, showing areas where flood risk is most concentrated. If a cluster area contains over 30,000 people predicted to be at risk from flooding, this area will be designated as a national Indicative Flood Risk Area.

The methodology outlined above has been followed at a national scale, identifying 10 Flood Risk Areas across England. None of these areas fall within the Torbay Council boundary and so there are no areas to review in the PFRA report. Within Torbay there are no cluster areas that exceed the threshold of 30,000 people at risk; the closest is in Paignton where 7,972 people are at risk.

7.2 Local Flood Risk Areas and the Identification of New National Indicative Flood Risk Areas

The 1km blue squares and cluster areas identified for Torbay have been issued by Defra and are shown on the maps identified in figures 5 and 6 respectively. The national thresholds used are explained on the maps, where these cluster areas do not exceed the nationally set threshold to become a national Indicative Flood Risk Area. The cluster areas have been analysed locally but it is still considered that there is no additional information to support any of these being identified as new Indicative Flood Risk Areas.

It is clear from the information collected and reviewed as part of this report that the surface water flood risk within Torbay is significant and therefore this will be identified as a priority in the local strategy.

Table 7 highlights the number of people at risk from surface water flooding in Torbay based on the “blue square” mapping. This figure has been split into the total number at risk in each town and within specific sub-catchments. The table also highlights the number of people at risk from flooding for a number of towns within Devon near Torbay.

Table 7**Number of People at Risk from Surface Water Flooding
Based on the “Blue Square” Mapping**

Town	Number of People At Risk of Flooding	Sub-Catchment	Number of People At Risk of Flooding
Brixham	1,675		
Galmpton	150		
Paignton	4,168	Clennon Valley	473
		Victoria Stream	1,404
		Occombe Valley	2,008
		Other areas	283
Torquay	3,908	Torre Abbey	1,137
		River Fleet	1,952
		Edginswell	367
		Babbacombe	452
Exeter	6,547		
Exmouth	913		
Dawlish & Dawlish Warren	817		
Teignmouth & Shaldon	2,041		
Newton Abbot	1,322		
Kingsteignton	480		
Totnes	1,020		
Dartmouth	803		
Ashburton	941		

8.0 Next Steps

8.1 Future Data Management Arrangements

In order to fulfil the role as Lead Local Flood Authority Torbay Council are required to investigate future flood events and ensure continued collection, assessment and storage of flood risk data and information.

It is likely that this requirement will be met most effectively by the Engineering section of Torbay Council recording information on a simple spreadsheet. It is crucial that all records of flood events are documented consistently and in accordance with the INSPIRE Directive (2007/2/EC). Flooding data received from other flood risk authorities together with the Torbay records will be maintained on a centralised database will be kept up to date by Torbay Council, who will have overall responsibility to manage flood data through the whole administrative area of Torbay. This can then be used as an evidence base to inform future assessments and reviews and for input into mapping and planning exercises.

8.2 Local Strategy for Flood Risk Management

Torbay's Local Strategy for Flood Risk Management will be viewed as a major tool to make a difference to communities at risk from flooding. It will take a more detailed assessment of the local areas, identified as part of the PFRA process, as being at risk from flooding. The local strategy will focus on setting future direction on flood risk management.

8.3 Reviewing and Updating Flood Data and Modelling

Data management and providing information is a key role for measuring flood risk in Torbay. The data must be managed and maintained in such a way as to ensure the most up to date information is available in order to make the correct strategic decisions on future work. As a result, it is intended that external access will be available to Torbay Council's GIS flood risk mapping to ensure that information is freely available for the public, planning authorities and others.

The PFRA process forms part of a continuous 6 year cycle for Lead Local Flood Authorities under the Flood Risk Regulations. However as Torbay have no national Indicative Flood Risk Areas within its boundaries, there are no Flood Hazard, Flood Risk Mapping or Management Plans to produce. Torbay Council will, however, be required to produce a revised PFRA report which will have to be completed by June 2017. It should be noted that Torbay Council as part of the Level 2 Strategic Flood Risk Assessment report have produced flood hazard data for the major flood risk areas within Torbay.

8.4 Scrutiny and Review Procedures

The scrutiny and review procedures that must be adopted when producing the PFRA are set out by the European Commission. Meeting quality standards is important in order to ensure that the appropriate sources of information have been used to understand flood risk and the most significant flood risk areas are identified.

Another important aspect of the review procedure is to ensure that the guidance is applied consistently. A consistent approach will allow all partners to understand the risk and manage it appropriately. The scrutiny and review procedure will comprise two key steps, as discussed below.

8.5 Local Authority Review

The first part of the review procedure is through an internal review of the PFRA, in accordance with the appropriate internal review procedures. Internal approval should be obtained to ensure that the PFRA meets the required standards, before it is submitted to the Environment Agency.

Within Torbay the PFRA will be taken to local flood risk partners for comments. It would have then been taken for approval by Torbay Council's Overview and Scrutiny Committee however due to the local elections in May 2011 it has not been possible to arrange a suitable committee meeting prior to the date identified for the PFRA to be submitted to the Environment Agency. It is proposed that the PFRA report will be presented to the Overview and Scrutiny Committee in either July or August 2011.

The Commissioning Officers Group has been provided with an overview of the PFRA together with the Flood and Water Management work in February 2011.

8.6 Environment Agency Review

Under the Flood Risk Regulations, the Environment Agency has been given a role in reviewing, collating and publishing all of the PFRA documents once submitted.

The Environment Agency will undertake a technical review (area review and national review) of the PFRA, which will focus on instances where Flood Risk Areas have been amended and ensure the format of these areas, meets the required standard. If satisfied, they will recommend submission to the relevant Regional Flood and Coastal Committee (RFCC) for endorsement. RFCCs will make effective use of their local expertise and ensure consistency at a regional scale. Once the RFCC has endorsed the PFRA, the relevant Environment Agency Regional Director will sign it off, before all PFRAs are collated, published and submitted to the European Commission.

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

References

Defra (2010) Selecting and reviewing Flood Risk Areas for local sources of flooding – Guidance to Lead Local Flood Authorities: Available from

<http://www.defra.gov.uk/environment/flooding/documents/research/flood-risk-method.pdf>

Defra Making Space for Water: Integrated Urban Drainage Management: Torbay Pilot Study: Available from

www.defra.gov.uk/enviro/fed/policy/strategy/ha2/Torbay/finalreport.pdf.

Environment Agency (2008) Managing Flood Risk: South Devon Catchment Management Plan

Environment Agency (2010) Preliminary Flood Risk Assessment – Final Guidance. Available from

<http://publications.environment-agency.gov.uk/pdf/GEHO1210BTGHe-e.pdf>

Environment Agency (2010) Environment Agency’s Data Share service (online).

Available from <http://www.geostore.com/environment-agency>

Environment Agency (2011) Preliminary Flood Risk Assessment – Annexes to the Final Guidance. Available from

<http://publications.environment-agency.gov.uk/pdf/GEHO1210BTHFe.e.pdf>

European Commission (2007) EU Floods Directive. Available from

<http://floods.jrc.ec.europa.eu/eu-floods-directive.html>

European Commission (2007) EU INSPIRE Directive. Available from

<http://inspire.jrc.ec.europa.eu/>

Floods and Water Management Act (2010), London: HMSO

Torbay Council (2010): Torbay Level 1 Strategic Flood Risk Assessment

Torbay Council (2011): Torbay Level 2 Strategic Flood Risk Assessment

Abbreviations

Acronym	Definition
AStSWF	Area Susceptible to Surface Water Flooding
AStGWF	Area Susceptible to Groundwater Flooding
BAP	Biodiversity Action Plan
Defra	Department for Environment, Food and Rural Affairs
CFMP	Catchment Flood Management Plan
EC	European Commission
FRIS	Flood Reconnaissance Information System
FMfSW	Flood Map for Surface Water
FWMA	Flood and Water Management Act 2010
GHG	Greenhouse Gas
GIS	Geographical Information Systems
NFCDD	National Flood and Coastal Defence Database
NRD	National Receptor Database
PPS25	Planning and Policy Statement 25: Development and Flood Risk
PFRA	Preliminary Flood Risk Assessment
RFCC	Regional Flood and Coastal Committee
SAB	Sustainable Urban Drainage System Approving Body
SAC	Special Area of Conservation
SPA	Special Protection Areas
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Urban Drainage System
SWW	South West Water
UKCIP09	United Kingdom Climate Change Predictions 2009

Figures

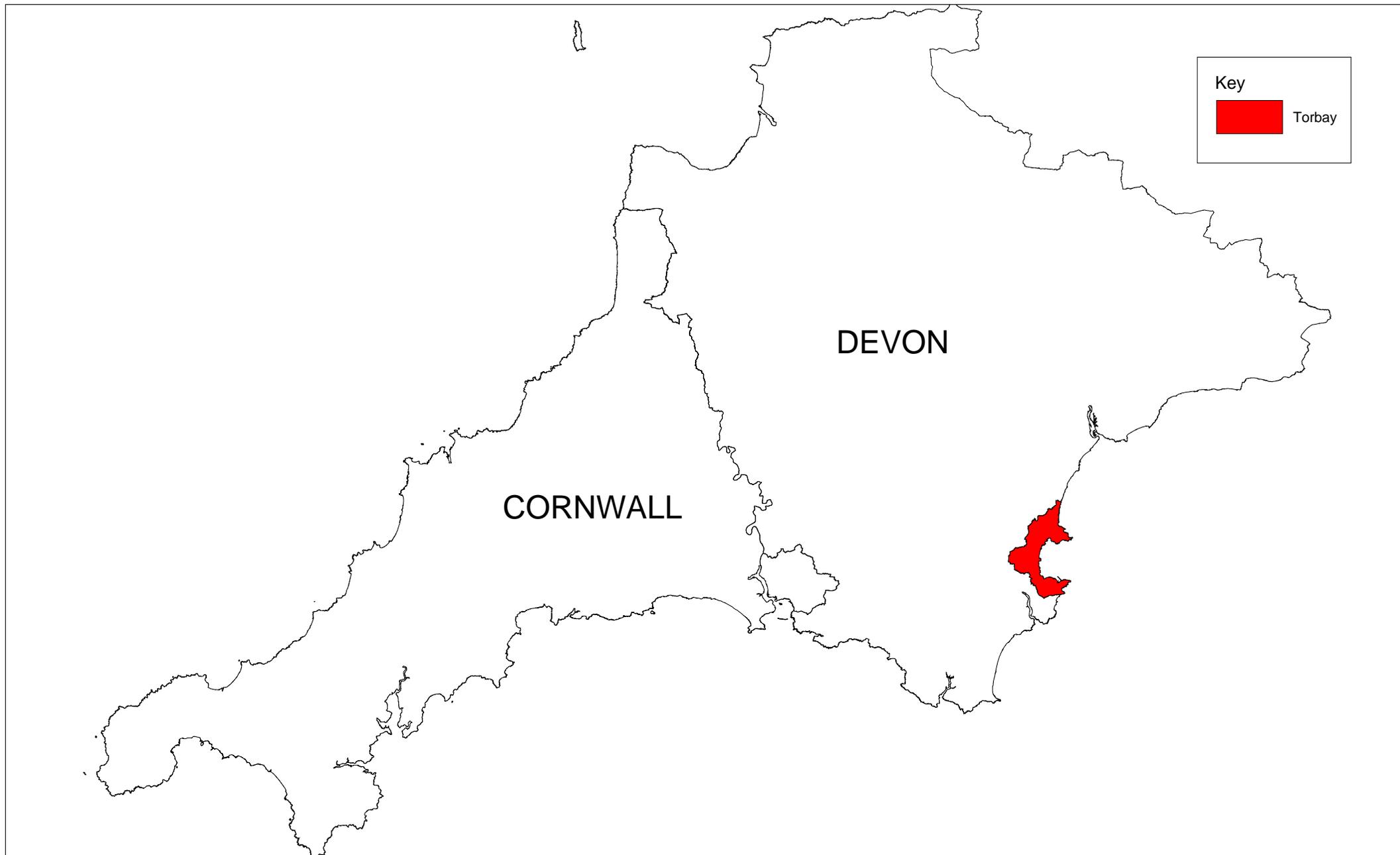
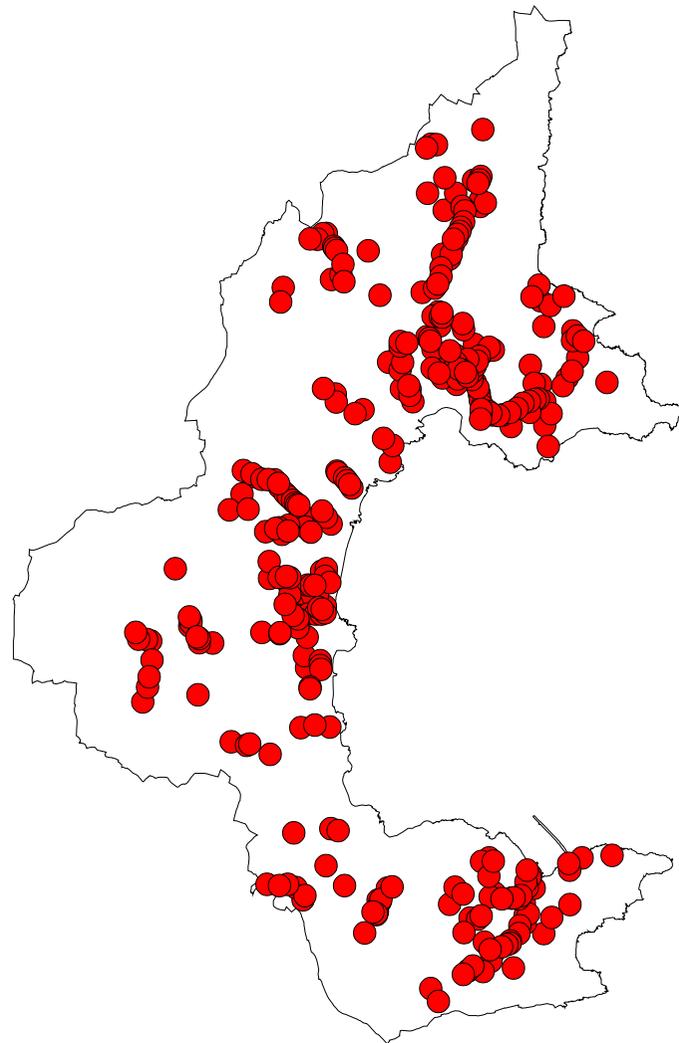


Figure 1 - Geographical Extent of Study Area

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782





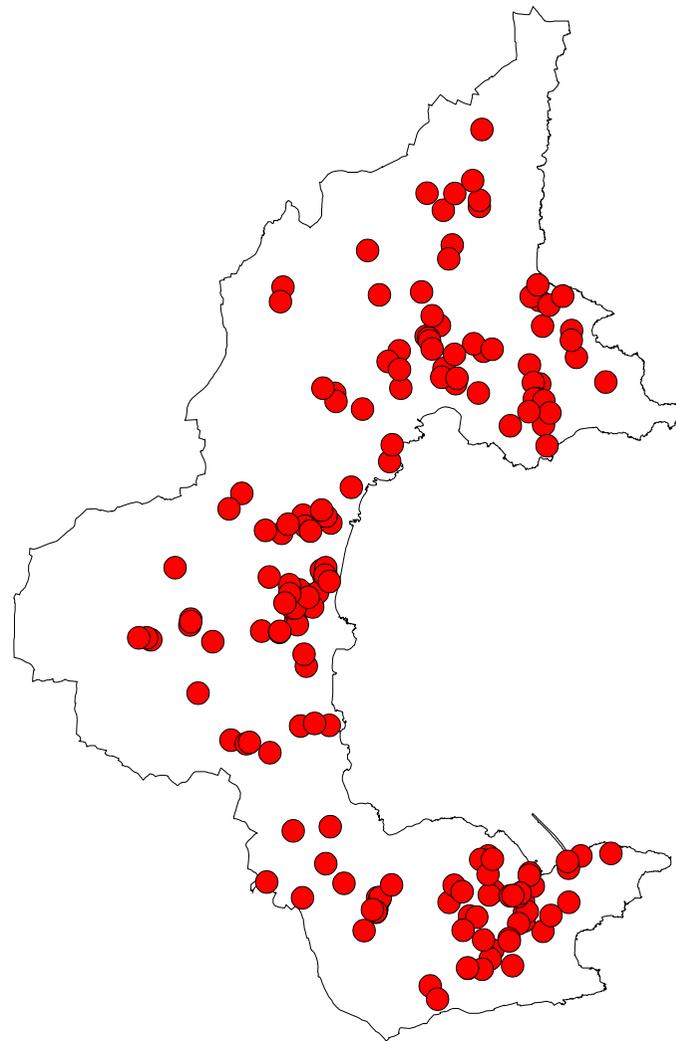
Key

● Flooding

Figure 3 - GIS Point Data

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782





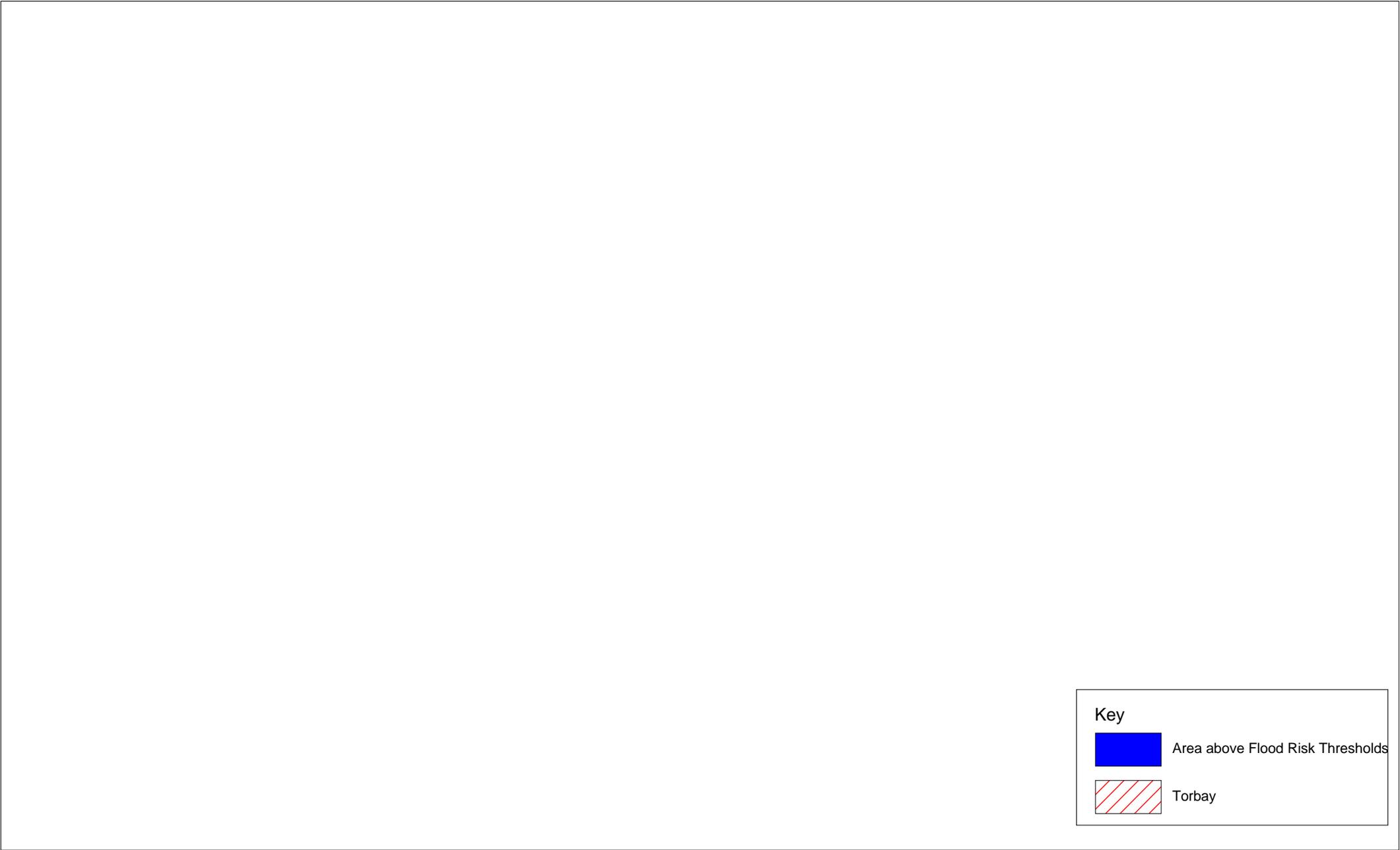
Key

- Surface Water Flooding

Figure 4 - Surface Water Flooding Incidents

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782





Key

-  Area above Flood Risk Thresholds
-  Torbay

Figure 5 - Blue Squares Showing Areas Above Nationally Set Flood Risk Threshold



Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782

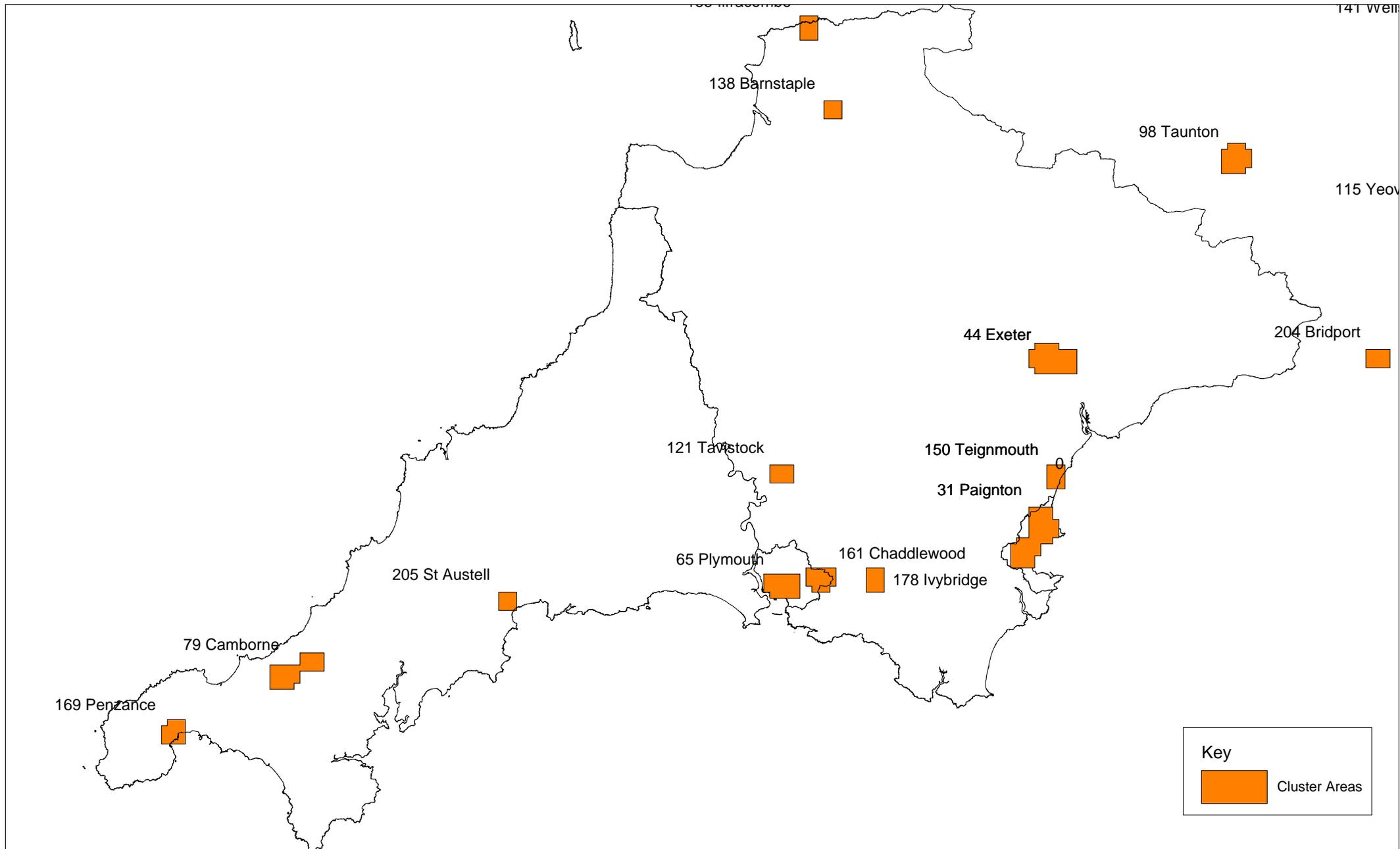
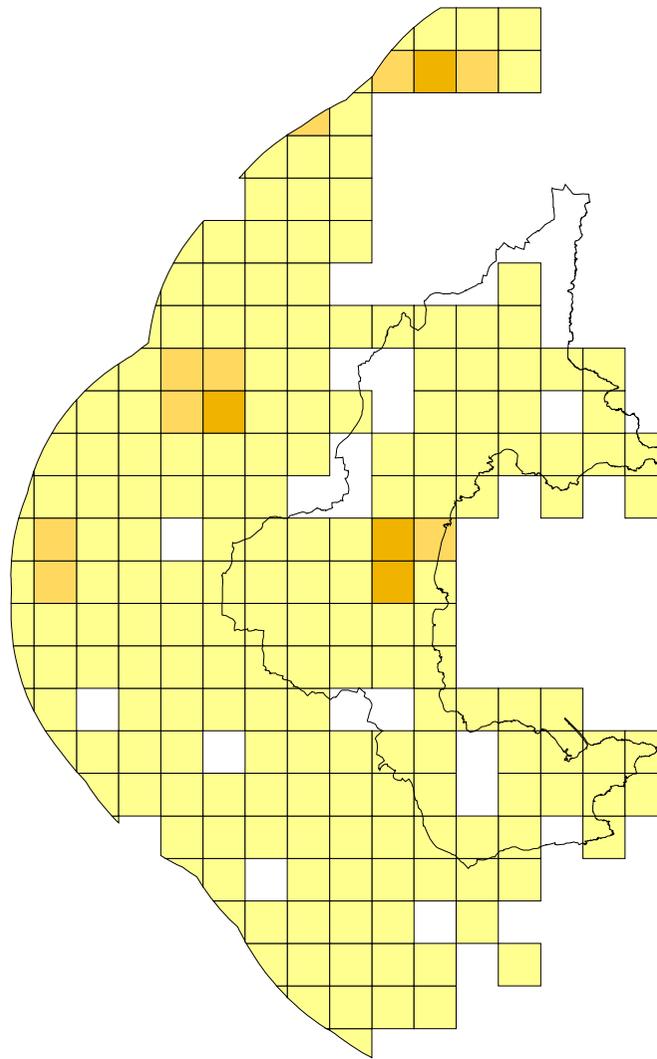


Figure 6 - Cluster Areas and Rankings of Local Areas of Flood Risk



Key
Risk

	< 25%
	>= 25% < 50%
	>= 50% < 75%

Figure 7 - Areas Susceptible to Groundwater Flooding

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
 Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782



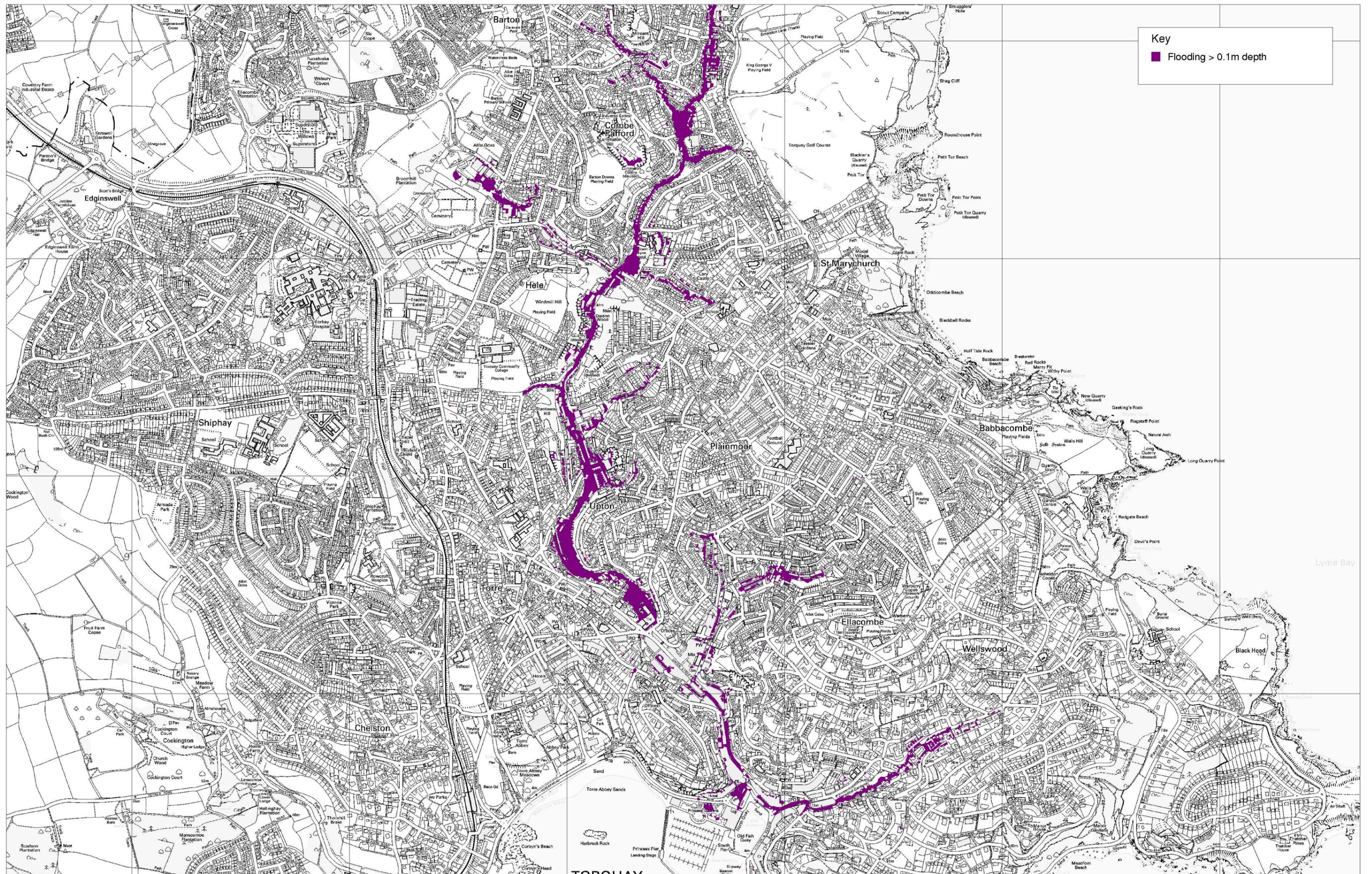


Figure 8 - Torquay Surface Water Flooding

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
 Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782



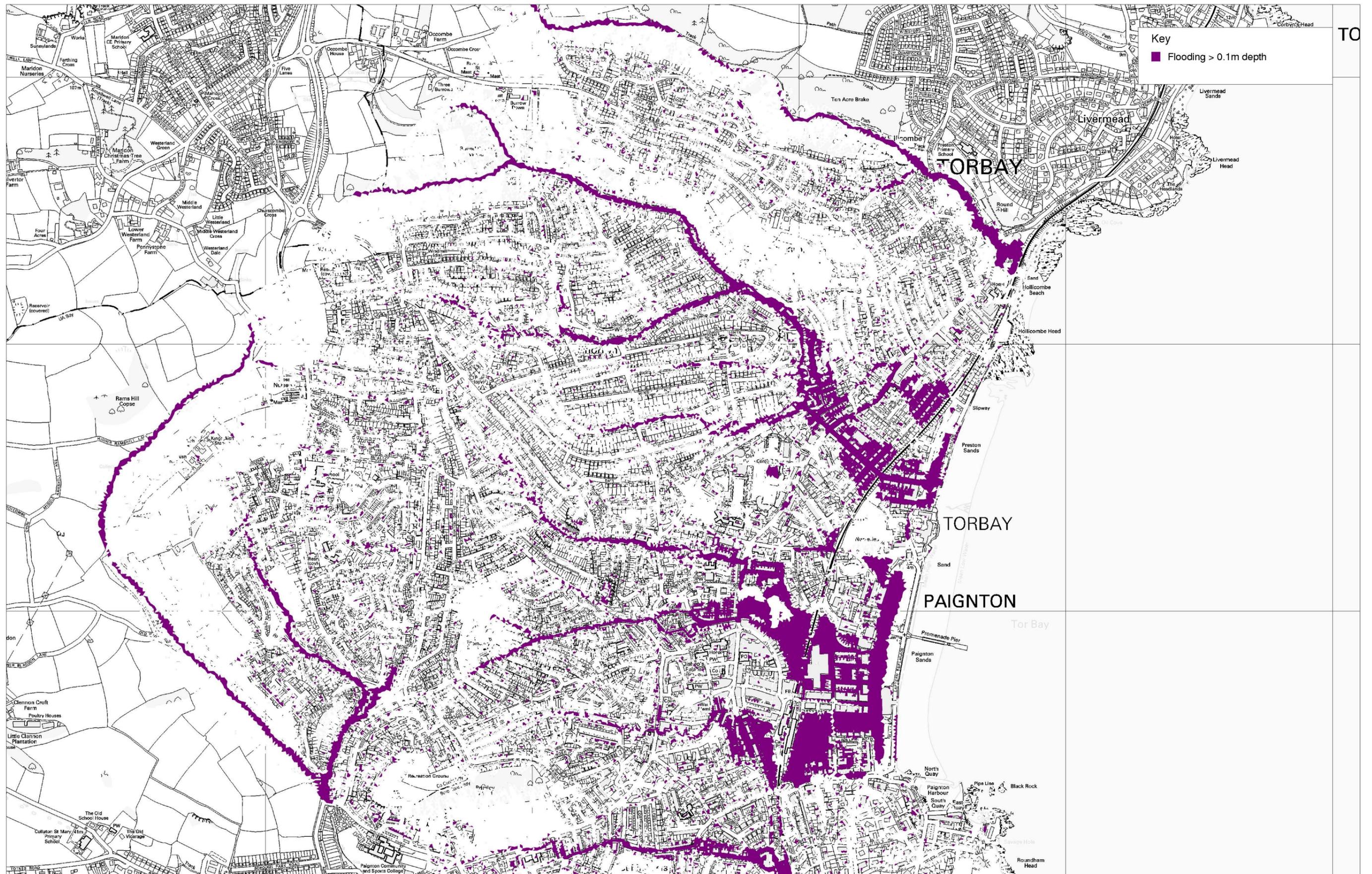


Figure 9 - Paignton Surface Water Flooding

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
 Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782

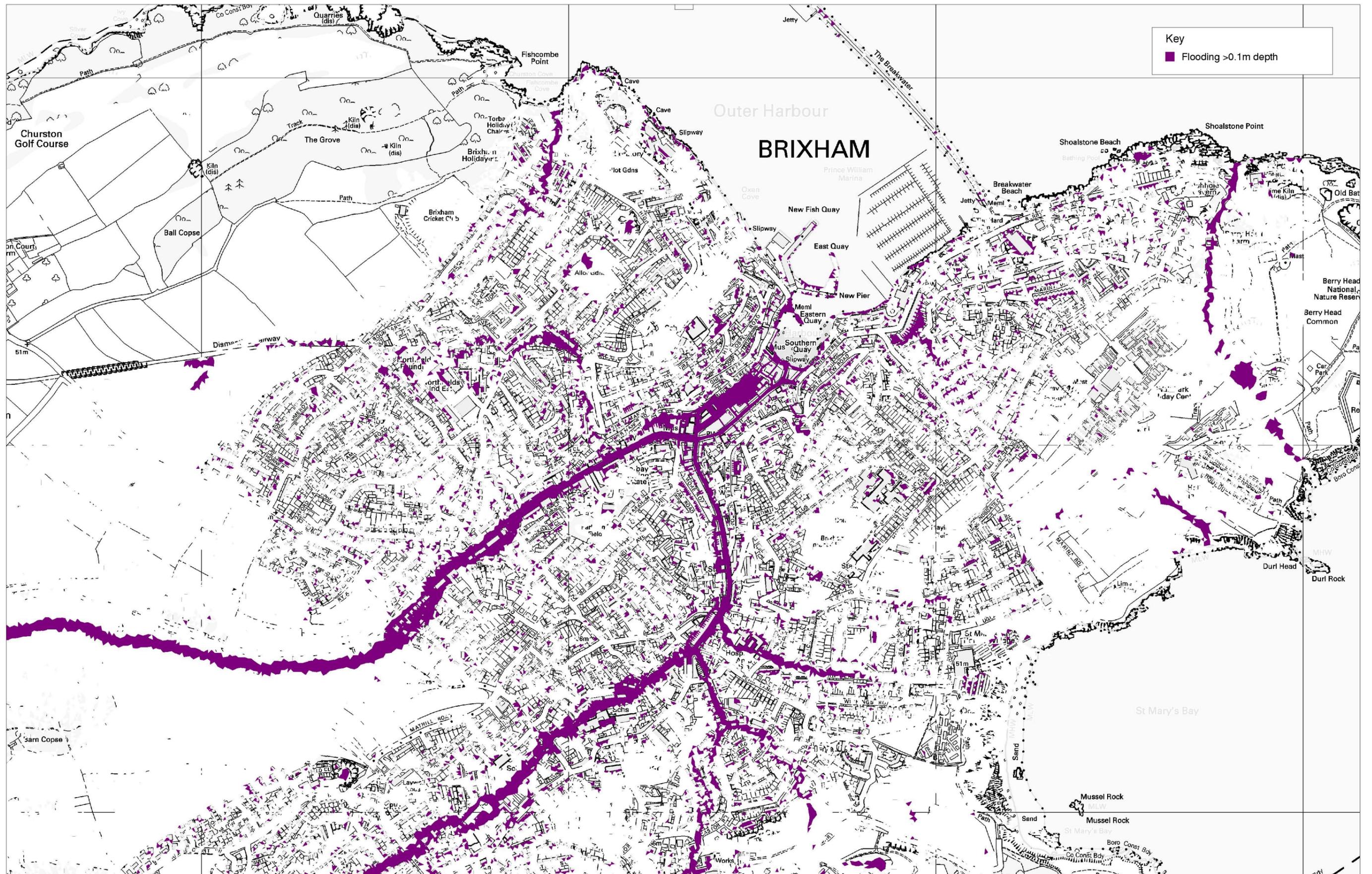


Figure 10 - Brixham Surface Water Flooding

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
 Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782



Figure 11 - Clennon Valley Surface Water Flooding

Reproduced from the Ordnance Survey mapping with the permission of the Controller of HMSO. (c) Crown Copyright.
 Unauthorised reproduction infringes crown copyright and may lead to prosecution or civil proceedings. Torbay Council LA079782

Annex 1

Records of Past Floods and Their Significant Consequences

Annex 2

**Records of Future Floods and Their Significant
Consequences**

Annex 3

Records of Flood Risk Areas and Their Rationale

(Note there are no National Indicative Flood Risk Areas within Torbay therefore there is no requirement to complete Annex 3)

ANNEX 3: Records of Flood Risk Areas and their rationale (preliminary assessment report spreadsheet)																									
Field:	Flood Risk Area ID	Name of Flood Risk Area	National Grid Reference	Main source of flooding	Additional source(s) of flooding	Confidence in main source of flooding	Main mechanism of flooding	Main characteristic of flooding	Significant consequences to human health?	Human health consequences - residential properties	Property count method	Other human health consequences	Significant economic consequences	Number of non-residential properties flooded	Property count method	Other economic consequences	Significant consequences to the environment	Environment consequences	Significant consequences to cultural heritage	Cultural heritage consequences	Origin of Flood Risk Area	Amended Flood Risk Area rationale	New Flood Risk Area rationale	Rationale detail	European Flood Risk Area Code
Mandatory / optional:	Mandatory	Mandatory	Mandatory	Mandatory	Optional	Optional	Mandatory	Mandatory	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Optional	Optional	Mandatory	Optional	Mandatory	Optional	Mandatory	Mandatory	Mandatory	Mandatory	Auto-populated
Format:	Unique number between 1-9999	Max 250 characters	12 characters: 2 letters, 10 numbers	Pick from drop-down	Max 250 characters, same source terms	Pick from drop-down	Pick from drop-down	Pick from drop-down	Pick from drop-down	Number between 1-10,000,000	Pick from drop-down	Max 250 characters	Pick from drop-down	Number between 1-10,000,000	Pick from drop-down	Max 250 characters	Pick from drop-down	Max 250 characters	Pick from drop-down	Max 250 characters	Pick from drop-down	Pick from drop-down	Pick from drop-down	Max 42 characters	
Notes:	<p>A sequential number starting at 1 and incrementing by 1 for each record.</p> <p>Name of the locality associated with the Flood Risk Area, a town, city, or county.</p> <p>National Grid Reference of the centroid (centre point) of the Flood Risk Area.</p> <p>Pick the source from which there is a significant flood risk generated by another source (other than the Main source of flooding). Report the definitions of sources.</p> <p>If there is also significant flood risk generated by another source (other than the Main source of flooding), report the source(s) here, using the same source terms.</p> <p>Pick a broad level of confidence in the Main source of flooding from: 'High' (compelling evidence of source - about 80% confidence that source is correct), 'Medium' (some evidence of natural or artificial defences or infrastructure, or of pumping), 'Blockage or restriction' (natural or artificial blockage or conveying a high degree of debris), or 'Low' (source assumed - about 20% confidence that source is correct) or 'Unknown'.</p> <p>Pick a mechanism from: Natural exceedance (of capacity), 'Defence' (floodwater overflowing defences), 'Failure' (of precipitation, at a slower rate than flash flood), 'Snow melt' (due to rapid snow melt), 'Debris flow' (restriction of a conveyance channel or system), or 'No data'. Most UK floods are 'Natural floods'.</p> <p>Has the Flood Risk Area been identified as a result of significant consequences to human health?</p> <p>Record the number of residential properties where the building structure would be affected either internally or externally by the flood.</p> <p>Where residential or non-residential properties have been counted, it is important to record the method of counting, to aid comparisons between counts. Choose from: 'Detailed GIS' (using property outlines, as per Environment Agency guidance), 'Simple GIS' (using property points), 'Estimate from map', or 'Observed number'.</p> <p>If the Flood Risk Area has been identified as a result of other significant consequences to human health, describe them (such as information about the number of critical services flooded).</p> <p>Has the Flood Risk Area been identified as a result of significant economic consequences? Describe them (such as information about the area of agricultural land flooded, length of roads and rail property outlines, as per Environment Agency guidance), 'Simple GIS' (using property points), 'Estimate from map', or 'Observed number'.</p> <p>If the Flood Risk Area has been identified as a result of significant economic consequences to the environment, describe them (such as information about national and international designated sites flooded, and pollution sources flooded).</p> <p>Has the Flood Risk Area been identified as a result of significant consequences to cultural heritage? Describe them (such as information about national and international designated sites flooded, and pollution sources flooded).</p> <p>Pick the origin from either: 'Indicative Flood Risk Area', 'Amended Flood Risk Area' (in which case Amend Flood Risk Area rationale is mandatory), or 'New Flood Risk Area' (in which case Amend Flood Risk Area rationale is mandatory).</p> <p>Pick the main rationale from either: 'Geography', 'Past floods', or 'Future floods'. Then provide further detail in Rationale detail.</p> <p>Pick the main rationale from either: 'Past floods', or 'Future floods'. Then provide further detail in Rationale detail.</p> <p>This is not mandatory if the Flood Risk Area was an indicative Flood Risk Area and has not been amended, or is a new Flood Risk Area.</p> <p>Summarise the rationale for amending an indicative Flood Risk Area, or identifying a new Flood Risk Area. Refer to Delta & WAG guidance to LLFAs on 'Selecting and reviewing Flood Risk Areas for local sources of flooding'. If the Flood Risk Area was an indicative Flood Risk Area and has not been amended, record 'Indicative Flood Risk Area'.</p> <p>This field will autopopulate using the LLFA name provided on the 'Instructions' tab, and the Flood Risk Area ID. It is an EU-wide unique identifier and will be used to report the Flood Risk Area information.</p> <p>Format: UK-CNS Code-A-LLFA Flood ID. 'CNS Code' is a unique reference for each LLFA. 'A' indicates it is a Flood Risk Area. 'LLFA Flood ID' is a sequential number beginning with 0001.</p>																								
Example:	1	London	SX1234512345	Surface runoff	NA	High	Natural exceedance	Natural flood	Yes	50000	Detailed GIS		No				No		No		Indicative	NA	NA	indicative Flood Risk Area	UKE1000012A0001
Records begin here:																									

Annex 4

Preliminary Flood Risk Assessment Checklist

Preliminary Flood Risk Assessment Checklist

Preliminary Flood Risk Assessment Checklist				
LLFA Name:				
Checklist questions	Notes for completion	LLFA	Environment Agency area review	Environment Agency national review
Step 1 Set up governance and develop partnerships				
1.1	Have appropriate governance and partnership arrangements been set up?	Refer to section 2.3 of guidance. Governance and partnership arrangements should be to the satisfaction of the LLFA.	Yes	
1.2	Who in the LLFA reviewed the PFRA and when was it done?	Please state the review and approval process and when approval was gained e.g. Officer, Scrutiny Committee, Cabinet. Refer to Section 5 of the guidance.		
Step 2 Determine appropriate data systems				
2.1	Has a data management system been established and implemented?	See Annex 5 for information about data standards	Yes	
Step 3 Collate information on past and future floods and their consequences				
3.1	Has information been requested from all relevant partners?	See Flood Risk Regulations Part 6 Co-operation.	Yes	
3.2	Are there any gaps in available information? (This could include gaps which could have been filled but weren't, or gaps which couldn't be filled because the information wasn't available)	LLFAs - Are there gaps in certain locations, or for certain events that you are aware of, or for certain sources of flooding (such as groundwater). Respond with Yes/No and provide comments on any missing information. EA Review - Has all available information been gathered and included?		
Step 4 Determining locally agreed surface water information				
4.1	Which datasets (or combination of datasets) has been determined as "locally agreed surface water information"?	LLFAs - Select from drop down. Refer to "Locally agreed surface water information" text box in section 3.5.1 (p.17) of guidance. EA review - Has this been agreed?	Flood Map for Surface Water	
4.2	Has the locally agreed surface water information been clearly stated and presented (on a map) in the Preliminary Assessment Report?	LLFAs - Select Yes/No from drop down list. Refer to "locally agreed surface water information" text box in section 3.5.1 (p.17) of guidance.	No	
4.3	If available, what is the total property count for locally agreed surface water information in the LLFA?	If known, please enter the total number of properties at risk in the LLFA.		
4.4	If applicable, has the method for counting properties been described in the Preliminary Assessment Report?	Refer to text box on page 17 of guidance	Yes	
4.5	Has available information on local drainage capacity (where used to inform the determination of locally agreed surface water information) been included in the report?	Refer to text box on page 17 of guidance. Information provided on drainage may inform options for any future improvements to the Flood Map for Surface Water.	N/A	
Step 5 Complete Preliminary Assessment Report Document				
5.1	Does the Preliminary Assessment Report cover all the content described in Annex 1 of the Environment Agency's PFRA guidance?	LLFAs - If the Preliminary Assessment Report contains all the content described in Annex 2 of the PFRA guidance, respond with a 'Yes'. If there are some elements missing, please provide a brief explanation. EA Review - Include comments on any missing content.	Yes	
5.2	Has a summary table of flood events been produced?	Refer to section 3.4 and 3.5 of guidance	Yes	
5.3	Has a description of past flood events been included?	Refer to section 3.4 and 3.5 of guidance	Yes	
5.4	Has additional information been included on climate change and long term developments?	Refer to 3.6 of guidance. Standard text has been provided for Preliminary Assessment Reports which meets the minimum requirements of the Flood Risk Regulations. Please respond with Yes or No, and if additional information has been included, please state the information source(s)	Yes	
Step 6 Record information on past and future floods with significant consequences in spreadsheet				
6.1	Are records of past flooding with significant harmful consequences recorded on the Preliminary Assessment Report spreadsheet (Annex 1 of Preliminary Assessment Report)?	LLFAs - past flooding should be recorded on the spreadsheet and included as Annex 1 of the Preliminary Assessment Report. EA review - Are all the mandatory fields complete?	Yes	
6.2	Are there any past floods with significant harmful consequences that have not been recorded? If so, please explain why not.	LLFAs - Respond with Yes or No. If No, provide additional information e.g. anecdotal information on flood, but not enough evidence to include. EA review - Do you agree with LLFA response and comments?	No	
6.3	Have any additional records of future flooding (other than the national dataset information which is already completed) been recorded on the future flooding Preliminary Assessment Report spreadsheet (Annex 2 of Preliminary Assessment Report)?	LLFAs - future flooding information should be recorded on the spreadsheet and included as Annex 2 of the Preliminary Assessment Report. EA review - Are all mandatory fields complete?	No	
Step 7 Illustrate information on past and future floods				
7.1	Have summary maps been produced for past and future floods?	Refer to section 3.4 and 3.5 of guidance	No	
Step 8 Review indicative Flood Risk Areas				
8.1	Is your LLFA within an indicative Flood Risk Area?	Indicative Flood Risk Areas were provided to LLFAs by the Environment Agency in December 2010.	No	
8.2	If the answer to 8.1 is yes, have you reviewed it using the locally agreed surface water information, and relevant local information in the Preliminary Assessment Report?	Refer to section 4 of guidance. LLFAs should identify whether they have reviewed against local information or just used the indicative Flood Risk Area information provided by the Environment Agency.	N/A	
Step 9 Identify Flood Risk Areas				
9.1	Is a Flood Risk Area proposed?	LLFA - select a response from the drop down list and then complete the relevant questions 9.1.1 - 9.1.5. (NB. Indicative Flood Risk Areas can be amended due to Geography, past flooding and/or future flooding.)	No - no Flood Risk Area is proposed (go to question 9.3)	
9.1.1	If the proposed Flood Risk Area is exactly the same as the indicative Flood Risk Area, please confirm.	LLFA - please confirm that the boundary of the indicative Flood Risk Area has not been changed and no change has been made to the flood risk indicators. EA review - please confirm		
9.1.2	If changes have been made to the indicative Flood Risk Area because of geography, please identify what changes have been made.	Use the drop down list to identify the reasons for the change. Options are the same as the table on page 26 of the PFRA guidance. EA review - please confirm evidence supports change		
9.1.3	If changes have been made to the indicative Flood Risk Area because of past / historic flooding, please indicate the changes and the reasons why.	LLFA - identify the scale of the changes made e.g. major/minor increase or decrease in size of Flood Risk Area and the source of information used e.g. records of historic flooding. EA review - confirm scale of the changes made and provide indication of confidence in the evidence provided e.g. anecdotal evidence versus detailed report on flooding event.		
9.1.4	If changes have been made to the indicative Flood Risk Area because of future flooding, please indicate the changes and the reasons why.	LLFA - identify the scale of the changes made e.g. major/minor increase or decrease in size of Flood Risk Area and the source of information used e.g. detailed modelling as part of SWMP. EA review - confirm scale of the changes made and indication of confidence in the evidence		
9.1.5	If a new Flood Risk Area is being proposed, does it meet the Defra / WAG thresholds?	Criteria and thresholds are set out in the Defra/WAG guidance on selecting and reviewing Flood Risk Areas for local sources of flooding. EA review - identify the evidence provided to support this and indicate degree of confidence in the evidence.		
9.2	Does the proposed Flood Risk Area include flooding from interactions with main river, reservoirs or the sea?	LLFAs should respond with Yes or No. EA Review - Summarise the location and nature of interactions i.e. river or sea.		
9.3	Has an indicative Flood Risk Area been deleted?	LLFA - Respond with Yes/No and if an indicative Flood Risk Area has been deleted please provide a short description why. EA - confirm the evidence presented to support this is aligned to locally agreed surface water information	No	
Step 10 Record information including rationale - ONLY COMPLETE IF ANSWER TO 9.1 IS YES				
10.1	If proposing Flood Risk Areas, have the mandatory fields in the spreadsheet been completed?	LLFAs - the spreadsheet indicates mandatory columns to be completed. EA Review - Are all mandatory fields complete?	N/A	
10.2	Has a rationale and evidence for amending/adding/deleting Flood Risk Areas been included in the Preliminary Assessment Report?	LLFAs - Refer to Table 5 on page 26 of the PFRA guidance and Annexes A-D of the Defra/WAG Guidance. Rationale should be included in "Identification of Flood Risk Areas" section of Preliminary Assessment Report. EA Review - Confirm that supporting evidence for any amendments/additions/deletions has been provided in the Preliminary Assessment Report and annexes	N/A	