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Appendices

Appendix A: Technical Review

Sources of Flooding

A.1.1. Experience has shown that the primary flood risk sources in Lewes as regards the potential extent and severity of flooding are the River Ouse and the sea. The impact of flooding from these two sources far outweighs that from any other flood risk source within the District.

A.1.2. The impact of flooding from secondary sources such as groundwater, sewers, surface water and infrastructure failure is very limited in its extent even though its local impact, in terms of the depth and velocity of flooding, may be comparable with that from the primary flood risk sources.

River Ouse

A.1.3. For the purposes of this Section, the River Ouse includes the many loops, backwaters and diversion channels along the river which are also classified by the Environment Agency as Main River as well as minor tributaries as shown in Appendix E. These secondary channels are all in hydraulic continuity with the river and water levels and flood levels within them are determined by flows in the Ouse. From a hydrology point of view, these associated channels have no significant catchment areas of their own.

A.1.4. The River Uck, main tributary of the Ouse, is also included in this analysis as, even though its catchment has a considerable size, the rate of flow associated with it is minor in comparison to the Ouse.

A.1.5. The River Ouse Catchment extends over an area of approximately 605 km² and can be subdivided into four smaller but significant sub-catchments. These are shown in Appendix E and summarised below:

- Upper Ouse (running from the south-east of Balcombe to Gold Bridge). This includes the source in the northwest of the catchment near Slaugham. The main tributaries in this reach are the Scrase Bridge Stream, the Shell Brook, the Cockhaise Brook and Pellingford Brook.
- Middle Ouse (covers the area from Gold Bridge to Barcombe Mills). This includes the major tributaries of the Shortbridge Stream, the Batts Bridge Stream, the Longford Stream and the Bevern Stream. The confluence with the Uck lies within this sub-catchment
- River Uck (covers the River Uck Catchment which feeds into the Ouse at Isfield). This is a major tributary of the River Ouse, draining approximately 110 km² of the northeast part of the Ouse catchment, including Uckfield and Buxted. Only 30% of the River Uck catchment drains directly into the river with the remainder entering via small tributaries.
- Lower Ouse (from Barcombe Mills to Newhaven). This is the tidal section of the Ouse. The major tributaries in this reach are the Glynde Reach and the seasonal Winterbourne Stream downstream of Lewes.

A.1.6. A summary of the Main Rivers and Critical Ordinary Watercourses found within Lewes District, as provided by the Environment Agency from the National Flood and Coastal Defence Database (NFCDD) is included in Appendix E.

Hydrometric Data

A.1.7. Flows within the River Ouse Catchment are gauged by the Environment Agency at a series of locations as shown in Appendix E. A summary of the gauging stations located within the Ouse Catchment is given in Appendix E.

A.1.8. In some areas the Environment Agency maintains automatic water level recorder stations on reaches of river for which there is no established level / flow relationship (stage / discharge rating) as there is at a purpose-built gauging station. Whilst these stations cannot be used to derive river flows they provide a useful record of water level variations, time of peak etc. These are also included in Appendix E.

Channel Survey Data

A.1.9. A series of channel surveys of various parts of the Ouse Catchment as far upstream as Ardingly have been carried out in connection with hydraulic models produced for the area between 2002 and 2006. The cross section data used has been made available by the Agency and is shown in Map 005.

Flood Defences

A.1.10. A National Flood and Coastal Defence Database (NFCDD) is used to hold up to date information on flood defence assets. Access to this database was not provided by the Agency; however, copies of the relevant tables have been made available.

A.1.11. Very little pre-1960 information on flood defences has been found. It is known, however, that Lewes hard defences were raised following the 1960 flood to a level slightly above the approximate 1960 flood level. In the 1970s, low flood banks were built between Lewes and Barcombe Mills to facilitate arable agriculture in the floodplain. These banks are overtopped on a regular basis during significant floods.

A.1.12. Between Newhaven and Barcombe Mills, the River Ouse has been embanked to reduce the frequency of flooding of the adjacent floodplain. In the area where surge tides could cause tidally influenced flooding, between Lewes and Newhaven, overtopping of the banks is infrequent.

A.1.13. In Uckfield, the river channel is incised and channel improvements were carried out between 1978 and 1981 to improve the flow capacity of Uckfield Mill and the railway bridge downstream.

A.1.14. Flood defences within Lewes District are reported to provide a standard of service ranging from 2 to 200 years along the Ouse and reaching a maximum of 1000 years along the coast. A significant amount of work is being carried out by the EA following the October 2000 flood event to ensure that flood defences in the District provide an acceptable standard of protection.

A.1.15. There are seven pumped drainage schemes, which maintain the drainage of agricultural land behind the tidal embankments on the Lower Ouse, by over pumping water from drainage ditches or tide-locked tributaries. The pumping stations are: Stoneham Pumping Station, Offham Pumping Station, Rodmell Pumping Station, ET Wadham Pumping Station, Ranscombe Pumping Station, Denton Pumping Station and Beddingham Pumping Station.

A.1.16. Additionally, run-off from the Malling area and the Downs of Cliffe Hill drain to an eighth pumping station on Malling Drain in Lewes.

A.1.17. It was recently brought to our attention that another two pumping stations under the management of Lewes District Council operate in the area. These are called Fuller Road/Hayward Road in Lewes and Stanley Turner Pavilion also in Lewes. No details of the purpose or operation procedures of these stations have been provided.

River Adur

A.1.18. The River Adur and its tributaries are situated in the High Weald, Low Weald and South Downs natural conservation areas. The catchment is largely rural, with an urbanised coastal strip of Brighton and Hove, Shoreham and Worthing. It is an area of rich landscape and environmental value, especially the remaining coastal downland and the wet grasslands of the River Adur floodplain.

A.1.19. A small part to the north-west of Lewes District is crossed by the east branch of the River Adur which drains 167 km^2, equivalent to approximately 25% of its catchment. The upper parts of the catchment (notably the High Weald) are drained by a relatively dense network of small streams. These small tributaries, particularly towards the east of the catchment, tend to be fairly flashy in nature, with rapid run-off and short time to peak.

A.1.20. A series of channel surveys of the east branch of the Adur have been made available by the Agency and are shown in Map 005. These were carried out in connection with hydraulic models produced for the area between 2002 and 2006.

A.1.21. Information from NFCDD with regards to defences along the East Branch of the River Adur has also been made available by the EA. These are shown in the 003 Flood Defences maps.

A.1.22. The River Adur Catchment Flood Management Plan – Scoping Report provides a general overview of the area.

Cuckmere River

A.1.23. The Cuckmere River is located in the south-east corner of Lewes District, almost coinciding with the local authority boundary. The head waters of this watercourse are found within the High Weald, an upland area of outstanding natural beauty with steeply sloping valleys, pockets of ancient woodland, and areas of unique low intensity farming practices which still maintain medieval field patterns. This upland area drains rapidly, resulting in high run-off rates on to the lower and less steep reaches of the river networks.

A.1.24. The Cuckmere River runs south through a relatively narrow and well defined flood plain, cutting through the eastern end of the South Downs, before passing through the embanked lower reaches and estuary to the sea.

A.1.25. Information from NFCDD with regards to defences along this stretch of the Cuckmere has been provided by the Agency.

A.1.26. The Cuckmere and Sussex Havens Catchment Flood Management Plan – Scoping Stage provides a general overview of the area.

Sea

A.1.27. The tidal influence along the River Ouse extends upstream from Newhaven at the mouth to Barcombe Mills. Along this stretch flooding can be caused by a combination of high tides and significant river flows that, individually, may not cause any difficulties to the system. Both sides of the River Ouse along this section are protected by flood defence embankments.

A.1.28. Along this section flood risk arises from the potential for water to breach or overtop the embankments either side of the Lower Ouse or when high river levels in the main channel prevent drainage from small tributaries. Water levels in the tidal reach are increased by high flows coming down the River Ouse, and relatively high spring and surge tides coming up the estuary. The effect on water levels by the incoming tide diminishes with distance from the river mouth.

A.1.29. Coastal defences and man-made drainage have to a great extent regulated flooding and erosion along most of the Sussex shoreline and these works have allowed urban development by the seaside. The potential flood hazard within this shoreline growth, generally located in low-lying areas, is quite high as most of this land is more than 1.5 m below Mean High Water Spring tide levels. Therefore, any breach of coastal defences is likely to cause extensive flooding.

A.1.30. The risk posed by the sea is exacerbated by the predictions of sea level rise associated with climate change. Following the guidelines set out in PPS25, it is estimated that sea level will rise by approximately 1.2m by the year 2115. This level of increase will render most of the existing defences inappropriate and place many coastal towns at significant risk.

A.1.31. One of the main sea defences in Lewes District is Seaford beach. Periodic replenishment of this shingle beach is carried out by the Environment Agency in order to maintain the standard of protection and the amenity value of Seaford.

A.1.32. A series of locations within Lewes District have been identified as having regular problems associated with coastal defences. These are:

- Overtopping is known to occur on a regular basis in Seaford at Marine Parade and Edinburgh Road.
- Tide locking is known to affect the Winterbourne Stream, Glynde Reach and the Cliffe area of Lewes.

A.1.33. A coastal monitoring programme implemented by the South Downs Coastal Group enables the identification of morphological changes taking place in the area and allows key coastal stakeholders to implement strategies to regulate sediment trends and erosion rates.

A.1.34. The South Downs Coastal Group consists of all the maritime operating authorities (i.e. Borough, District and Unitary Councils), the Environment Agency, East and West Sussex County Councils, Port Authorities, English Nature, English Heritage and fisheries interests - The Regional Engineer from The Department of Environment, Food and Rural Affairs (DEFRA) and a representative from the Sussex Downs Conservation Board are observers.

A.1.35. DEFRA (formerly MAFF) and the Environment Agency have carried out a significant amount of work with the view of providing a sustainable approach to coastal protection. This work involves the production of Shoreline Management Plans and Coastal Defence Strategies which provide a detailed analysis of the natural processes taking place along the coast. The coastal part of Lewes District is covered within the series of documents extending from Beachy Head to Selsey Bill.

A.1.36. The Shoreline Management Plan Polices for the Lewes District coast are summarised below:

- Seaford Head: No active intervention, which will result in some cliff retreat and loss of assets.
- Seaford: Hold the line to prevent flooding of the town by maintaining the Seaford Beach Renourishment Scheme. In the long term upgrading of defences will be required.
- Seaford (Tide Mills) to Newhaven Harbour: Managed Realignment will allow the formation of a wide shingle beach.
- Newhaven Harbour and Ouse Valley: Hold the line to protect and sustain existing assets
- Newhaven Harbour to Peacehaven Heights: No active intervention along the cliff face but limit cliff toe erosion.

Sewers

A.1.37. Flooding from surface water sewers could be expected to occur as a result of intense, short duration rainstorms, such as summer thunderstorms. The rapid runoff from impermeable areas overwhelms the capacity of the urban drainage system and the sewers become surcharged. Water escapes from the sewer at manholes and flows over the ground surface, generally along the line of the sewer. This type of "flash" flooding is characterised by a brief but severe impact over relatively small areas, particularly to property along the line of the sewer.

A.1.38. Until recently the ageing drainage infrastructure within the district and in particular in the town of Lewes frequently contributed to flooding (both storm water and sewage) and consequent poor water quality in the River Ouse. Major improvements to the sewerage infrastructure in the district are reported to have taken place since 1990 and the completion of the Lewes Sewerage Improvement Scheme is deemed to have greatly reduced this risk.

A.1.39. The Lewes Integrated Urban Drainage Pilot Scheme is being implemented by the Environment Agency, Southern Water, East Sussex County Council and Lewes District Council with a view to integrate the management of all facets of the drainage system and provide the best possible level of service to the town of Lewes. The technical report for these studies is expected to be completed by April 2008.

A.1.40. The 004 Historical Flooding maps show the location of sewer-related flooding incidents within Lewes District, as indicated by Southern Water. The location of the principal sewers in the built-up areas of the district, as provided by Lewes District Council is included in the 006 Sources of Potential Flood Risk maps.

Reservoirs and Canals

A.1.41. There is currently one fully operational reservoir in Lewes District (Barcombe) with another one located in Wealden District Council in close proximity to Lewes District (Arlington). A new reservoir is also being proposed within Lewes District at Clay Hill.

A.1.42. Barcombe Reservoir, built in 1965, is an earthfill dam with a capacity of 548,000m^3 and covers an area of 159,000m^2. The typical water level is 9.14mOD and the embankment crest has an approximate level of 10mOD.

A.1.43. Arlington Reservoir was built in 1970 and consists of a gravity and earthfill dam covering an area of 486, 000m^2 with a capacity of 3,550,000m^3. The typical water level is 17.37mOD with an embankment crest of the order of 19mOD.

A.1.44. Feasibility studies are being carried out for the proposed construction of a third reservoir within Lewes District. Preliminary indications suggest that the preferred location would be an area between Ringmer and Isfield known as Clay Hill. This reservoir is being designed to provide at least 18 million litres of water each day and is scheduled to be completed by 2015.

A.1.45. Due to security issues, only very brief details of the existing reservoirs have been made available. A comprehensive analysis of this potential source of flooding has therefore not been possible.

A.1.46. Lewes District Council and the Environment Agency have confirmed that no canals exist within the District boundaries or its immediate vicinity.

Groundwater

A.1.47. High groundwater levels and resultant spring flows are recognised as a source of flooding within the catchment; however this occurs in relatively few urban areas.

A.1.48. Due to the underlying chalk aquifer, groundwater flow is a real concern in the Lower Ouse. When groundwater flooding does occur it can last for months and therefore damages can be significant.

A.1.49. The risk posed by groundwater in Lewes District was analysed by the following means:

- Hydrogeological map for the South Downs
- Geological Map for Lewes District
- Groundwater Vulnerability Map for East Sussex

A.1.50. The hydrogeological map shows typical levels of the water table which were compared with ground levels to estimate the likelihood of groundwater reaching the surface.

A.1.51. A groundwater vulnerability map produced by the Environment Agency was used to identify the different types of aquifers within Lewes District. This was derived from the Geology map for the area.

A.1.52. We have contacted the Centre for Ecology and Hydrology (CEH) with regards to the Baseflow Index (BFI) for the rivers Ouse, Uck and Cuckmere within Lewes District. The baseflow measures the proportion of the river's long term runoff that is derived from stored sources, and typically ranges from 0.1 for relatively impermeable clay catchments to 0.99 for highly permeable chalk catchments. The following table summarises BFIs calculated by CEH and made available for this study.

Table A.1 Summary of Baseflow Index Values

River	Gauging Station	Baseflow Index
Ouse	Gold Bridge (41005)	0.51
Ouse	Barcombe Mills (41004)	0.43
Uck	Isfield (41006)	0.40
Cuckmere	Cowbeech (41016)	0.40
Cuckmere	Sherman Bridge (41003)	0.28

A.1.53. Additionally, it is our understanding that the University of Brighton is currently carrying out a comprehensive study of Groundwater issues in the South Downs titled “Flood1”. We have contacted the School of Environment of the University of Brighton for information on this project and they have indicated that the data will be made available to the public within the next few months.

A.1.54. It is recommended that following the publication of the “Flood1” study, the findings are incorporated into the Strategic Flood Risk Assessment at the first revision in 2010.

Adjacent Land

A.1.55. The effect of adjacent land has been considered using LIDAR data, for the areas surrounding the main watercourses. Ordnance Survey contours have been used for the rest of the District.

A.1.56. For the purposes of particular developments, this risk should be considered as part of a site specific flood risk assessment.

Hydraulic Modelling

A.1.57. A significant amount of work has been carried out in flood risk/prevention as a result of the 2000 floods. A brief summary of the hydraulic models for which general details and flood outlines were made available for this study is included in Appendix E.

A.1.58. As part of the Environment Agency's flood risk mapping programme, studies were carried out to categorise fluvial and tidal flood plains into high, medium and low risk areas, to identify the individual properties within those areas, and to determine in broad terms the type of flood warning service appropriate to different risk areas. A summary table of this categorisation applied to recognised risk areas within the River Ouse catchment was included in the CFMP and is presented as Appendix H of the CFMP. It must be noted that this table was produced based on post flooding surveys and witnesses' accounts of the 2000 flood event and does not take into account the various flood alleviation schemes completed following the 2000 floods.

A.1.59. Two areas within Lewes District were identified as requiring more detailed hydraulic modelling analysis due to proposals for redevelopment being put forward. It was therefore deemed necessary to establish the potential effects that raising flood defences along flood cell 4 in Lewes and flood compartment 4 in Newhaven would have on the rest of the system. Additional hydraulic modelling was carried out for this purpose as part of this study. A brief summary of this process is included in Appendix E.

Climate Change

A.1.60. Annex B of PPS25 sets out guidelines with regards to climate change. An increment of 20% over and above current peak flow levels to account for the effects of climate change up to the year 2115 is recommended. By applying the recommended sea level rise rates included in the same document to the Lewes District, it was estimated that for the same year (2115), a sea level rise of the order of 1205mm could be expected.

A.1.61. The hydraulic modelling carried out to date does not take into consideration the PPS25 requirements for climate change. Therefore, it was necessary to run the available models for the climate change scenario in order to determine the likely future extent of the various flood zones within Lewes District. A summary of the modelling process undertaken as part of the SFRA is included in Appendix E.

Residual Flood Risk

A.1.62. Residual Flood Risk is defined as the risk which remains after all risk avoidance, reduction and mitigation measures have been implemented.

A.1.63. The EA has carried out intensive modelling of the Ouse Catchment and identified the areas benefiting from flood defences (see the 010 Residual Flood Risk maps). The areas with residual flood risk could be described as the sectors within flood risk zones 2, 3a or 3b and not benefiting from flood defences.

A.1.64. For planning purposes, the effect of flood defences in protecting the different areas must only be taken into account during the application of the exception test.

Flood Alleviation Measures

A.1.65. A series of Flood Alleviation Schemes have been implemented throughout the Ouse Catchment over the years. A brief summary of the most significant is included in Appendix E.

A.1.66. Following recommendations set out in the River Ouse Flood Management Strategy, the Environment Agency is in the process of providing flood alleviation measures for the Lewes District with special emphasis on Lewes town, one of the most populated and worst affected areas during the 2000 floods.

A.1.67. The first big scale post-2000 flood alleviation scheme was completed in the Malling Brooks area of Lewes (Cell 1) which is reported to provide a standard of protection of 1 in 200 years.

A.1.68. Detailed studies are currently under way for the improvement of flood defences in the Cliffe area of Lewes town (Cell 2). This works are likely to be completed within the next 5 years.

A.1.69. It is our understanding that the Environment Agency is in the process of reviewing the existing flood defences along the Ouse with the view of setting out an upgrading programme in line with the ever increasing risk posed by climate change.

Flood Risk Mapping

A.1.70. The strategic flood risk mapping of Lewes District and the preparation of the set of flood risk maps, included in the Maps section, has been based principally upon the results obtained from the various hydraulics models produced for the watercourses within the District. An overview of the modelling is provided in Appendix E.

A.1.71. For the purposes of this study, the quantitative limits of the flood risk categories used will correspond exactly with the flood zones defined in PPS25 (Table 1). Since the Environment Agency's Flood maps represent an important initial attempt to define the limit of PPS25 Flood Risk Zones 2 and 3 they will be used as the basis for the detailed strategic (i.e. District-wide) assessment of flood risk within Lewes.

A.1.72. One of the requirements of PPS25 is the identification of Flood Zone 3b: Functional Floodplain (area likely to be flooded during the 1 in 20 year return period event, unless otherwise agreed with the Environment Agency). For this effect a number of sources of data and information were available. These are:

- LIDAR Data
  The Environment Agency has established a national database of topographical spot-level data derived from an airborne laser imaging process. At present the LIDAR data coverage does not extend over the whole country. In Stage 1 of the Study, a small scale plan made available by the Agency suggested that the amount of LIDAR data coverage within Lewes District was limited to the main watercourses and immediate vicinity.
- Ordnance Survey Maps
  A digital OS mastermap was made available for Lewes District. This map was contoured at 5m intervals which is adequate to give an indication of the shape of the floodplain at any location. The contours are supplemented by spot heights to the nearest 1m on roads. It should, however, be noted that road levels can, particularly in floodplains, be significantly higher than adjacent land levels.
- EA Flood Maps
  EA Flood Maps were used to verify the general shape of the outline of the functional floodplain and at the same time to confirm the EA flood zones outlines.
- Aerial Photographs
  Aerial photography was used to clarify doubts in terms of pathways or receptors in areas where these could not be clearly identified using LIDAR data or OS maps.
- East Sussex County Council (ESCC) – Highways Department Information
  The Highways Department of ESCC provided us with general information of structures (mostly bridges) likely to have an effect on the flow path during times of flooding. Unfortunately the data did not contain ground level information and therefore it could not be used in the interpretation of the pathways.

A.1.73. The assessment of the information available at the end of Stage 1 suggested that hydraulic modelling results for the undefended 1 in 20 years return period event scenario were not available. Therefore, in consultation with the Environment Agency and Lewes District Council it was decided that the functional floodplain would be drawn based on the available results for the 1 in 25 year return period scenario.

A.1.74. Results for the production of the functional floodplain outline for the Cuckmere were not available and therefore this area has not been incorporated into the functional floodplain map. It must therefore be assumed in first instance that Flood Zone 3a, equivalent to Flood Zone 3 (EA), represents the functional floodplain until this information is included in the SFRA.

A.1.75. The table below summarises the different flood outlines produced as part of the Level 1 SFRA and how they have been derived. These should be referred to in first instance when undertaking the Sequential Test.

Table A.2 Flood Outlines Produced as Part of the SFRA and included in Maps 002

Watercourse	Flood Outline	Return Period	Data Sources	Scenario
River Ouse	Flood Zone 3b	25 years	Modelling results and LiDAR Data provided by the EA	Defended*
	Flood Zone 3a	100 years	EA Floodmap (Flood Zone 3)	Undefended
	Flood Zone 2	1000 years	EA Floodmap (Flood Zone 2)	Undefended
River Uck	Flood Zone 3b	25 years	Modelling results and LiDAR Data provided by the EA	Defended*
	Flood Zone 3a	100 years	EA Floodmap (Flood Zone 3)	Undefended
	Flood Zone 2	1000 years	EA Floodmap (Flood Zone 2)	Undefended
Cuckmere	Flood Zone 3b	N/A	N/A	N/A**
	Flood Zone 3a	100 years	EA Floodmap (Flood Zone 3)	Undefended
	Flood Zone 2	1000 years	EA Floodmap (Flood Zone 2)	Undefended

*No equivalent results for the undefended scenario were readily available.
** No information was made available for the production of the functional floodplain for this watercourse. It must therefore be assumed in first instance that Flood Zone 3 (EA) is the functional floodplain until this information becomes available and is incorporated to the SFRA.

A.1.76. The effect of climate change on fluvial flood risk has been considered along the advice provided by the EA. It must be noted that the advice has changed since then and therefore the climate change outlines should be revisited during the first revision of the SFRA. A summary of the information used to produce the climate change scenario is included below.

Table A.3 Summary of Climate Change allowances made as part of the Hydraulic Modelling for the SFRA

Watercourse	Type of Modelling	Climate Chance Allowance	Climate Change Outline Produced	Scenario
River Ouse	ISIS	1000year + 20%*	Yes	Defended
River Uck	N/A	No	No**	N/A
Cuckmere	N/A	No	No**	N/A

*Produced based on the advice received from the EA at the time. The advice has change since then and the modelling carried out to inform the Level 2 SFRA incorporates this change for Lewes flood cell 4 and Newhaven flood compartment 4.
**There are climate change outlines produced as part of the flood mapping carried out by the Agency. These take into account the 1 in 100yr + climate change event and were not considered for this study as the initial advice from the EA deemed them inappropriate. In light of most recent advice they should be revisited and added to the next revision of the SFRA.

A.1.77. Tables 6 and 7 summarise the information produced as part of the Level 1 SFRA and which should be used in first instance for the application of the Sequential Test. In addition to the above and as part of the Level 2 SFRA, further detailed modelling was undertaken for Flood Cell 4 Lewes and Flood Compartment 4 Newhaven. This information should be used to inform decisions with regards to development in these areas, in particular when applying the exception test.

A.1.78. Different scenarios were modelled for Lewes and Newhaven as part of the Level 2 SFRA. These are summarised in the tables below.

Table A.4 Fluvial scenarios modelled for Lewes Flood Cell 4

Fluvial Return Period (years)	Tidal Boundary	Existing	Undefended	Raised Defence
20	MHWS (2007)	✓		✓
100	MHWS (2007)	✓	✓	✓
100 +20%	MHWS (2115)	✓		✓
1000	MHWS (2007)	✓		✓

Table A.5 Tidal scenarios modelled for Newhaven Flood Compartment 4

Fluvial Return Period (years)	Tidal Boundary	Existing	Undefended	Raised Defences
20	20yr (2007)	✓		✓
2	200yr (2007)	✓	✓	✓
2	200yr (2115)	✓		✓
2	1000yr (2007)	✓		✓

A.1.79. Further details of the additional work undertaken to inform the Level 2 SFRA can be found in Appendix E.

A.1.80. Our assessment has shown that although the EA Flood Maps are generally accurate and reliable, close inspection reveals various anomalies in the plotting of the envelope. These anomalies can be grouped into six types, as follows:

- Where the flood level on one side of a floodplain is significantly different from that on the other.
- Where the flood envelope does not follow a closely adjacent contour line where "ponded" flooding is known or can be assumed to occur.
- Where the edge of the flood envelope indicates that the flood level at a point downstream is higher than the level a significant distance upstream.
- Where the presence of an "island" in the floodplain has been overlooked.
- Where the water level gradient implied by the flood envelope boundary is clearly at variance with the general land level gradient along the valley floor in that area, except where due to an obvious obstruction to flow.
- Where the presence of an obvious obstruction to overbank or channel flows (artificial embankment, restricted waterway at bridge, etc) has been overlooked.

A.1.81. Various locations where abnormalities in the flood zone maps were evident have been identified throughout this study. Due to the relatively small area of coverage and inaccuracies found in the LIDAR data for the District, the EA flood zones have not been modified at this stage. These anomalies have been summarised below.

- Flood zones 2 and 3 covering the part of the River Adur pertaining into Lewes District. The LIDAR data appears to be inaccurate.
- Flood zones 2 and 3 at coordinates 544875, 100852. The outline does not match the estimated water level obtained from the hydraulic model.

A.1.82. It is recommended that the discrepancies in the EA flood maps are rectified at the earliest possible opportunity by the Agency and the SFRA is kept up to date with the latest information available.

A.1.83. The data used for GIS Mapping was obtained from an array of sources and of varying degrees of quality. The following table provides an analysis of the information used for mapping purposes in this study.

Table A.6 Summary of Tables used in the Assessment

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
Adur_Tidal_ABD	From information provided by EA	Polygon layer (outline) showing areas along the tidal part of the Adur benefiting from flood defences	Yes		Shows areas benefiting from flood defences along the tidal part of the Adur	EA information. Not verified by FM
Adur_Tidal_ABD_Region	From information provided by EA	Polygon layer (region) showing areas along the tidal part of the Adur benefiting from flood defences	Yes		Shows areas benefiting from flood defences along the tidal part of the Adur	EA information. Not verified by FM
Adur_Xsecs_all	From information provided by EA	Point data layer providing location and brief details of cross sections used for modelling purposes	Yes		Shows location of cross sections used for hydraulic modelling purposes	
CoastalFWAs	From information provided by EA	Polygon layer showing coastal areas benefiting from flood warning schemes	Yes		Shows coastal areas benefiting from flood warning schemes	Unverified data
Current_Boreholes_Lewes_DC	From information provided by EA	Point data layer providing location and brief details of borehole information	Yes		Shows location and details of boreholes within Lewes District.	
Evacuation_sectors_bc	From information provided by EA	Polygon layer showing details of evacuation sectors within the District	Yes		Shows details and locations of evacuation sectors	
FEO_Lewes_1960	From information provided by EA	Polygon layer showing extent of the flood outline during the flood of 1960 in Lewes	Yes		Shows extent of the flood outline during the flood of 1960 in Lewes	Unverified data
FEO_Ouse_1975	From information provided by EA	Polygon layer showing extent of the flood outline during the flood of 1975 (River Ouse)	Yes		Shows extent of the flood outline during the flood of 1975 (River Ouse)	Unverified data
FEO_Ouse_2000	From information provided by EA	Polygon layer showing extent of the flood outline during the flood of 2000 (River Ouse)	Yes		Shows extent of the flood outline during the flood of 2000 (River Ouse)	Unverified data
FEO_Ringmer_1987	From information provided by EA	Polygon layer showing extent of the flood outline during the flood of 1987 in Ringmer	Yes		Shows extent of the flood outline during the flood of 1987 in Ringmer	Unverified data

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
FEO_Seaford_1996	From information provided by EA	Polygon layer showing extent of the flood outline during the flood of 1996 in Seaford	Yes		Shows extent of the flood outline during the flood of 1996 in Seaford	Unverified data
FEpoints	From information provided by EA	Point layer showing location of flood events in Lewes District	Yes		Shows location of flood events in Lewes District	Unverified data
flood_cells_AJS_030204	From information provided by EA	Polygon layer showing extent of flood cells in Lewes	Yes		Shows extent of flood cells in Lewes	
Flood Sector A	From information provided by EA	Polygon layer showing extent of flood risk sector A in Lewes	Yes		Shows extent of flood risk Sector A in Lewes	
Flood Sector B	From information provided by EA	Polygon layer showing extent of flood risk sector B in Lewes	Yes		Shows extent of flood risk Sector B in Lewes	
Flood Sector C	From information provided by EA	Polygon layer showing extent of flood risk sector C in Lewes	Yes		Shows extent of flood risk Sector C in Lewes	
Flood Sector D	From information provided by EA	Polygon layer showing extent of flood risk sector D in Lewes	Yes		Shows extent of flood risk Sector D in Lewes	
Flood Sector E	From information provided by EA	Polygon layer showing extent of flood risk sector E in Lewes	Yes		Shows extent of flood risk Sector E in Lewes	
Flood Sector F	From information provided by EA	Polygon layer showing extent of flood risk sector F in Lewes	Yes		Shows extent of flood risk Sector F in Lewes	
FloodWatchAreas_Lewes_DC	From information provided by EA	Polygon layer showing extent of flood watch areas in Lewes District	Yes		Shows extent of flood watch areas in Lewes District	
FluvialFWAs	From information provided by EA	Polygon layer showing fluvial areas benefiting from flood warning schemes	Yes		Shows fluvial areas benefiting from flood warning schemes	Unverified data
Full_Adur_Output_PAB	From information provided by EA	Point data layer providing location of cross sections and brief details of modelling results for the Adur	Yes		Shows location of cross sections and brief details of modelling results for the Adur	Unverified data

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
Full_Adur_Output_PABa	From information provided by EA	Point data layer providing location of cross sections and brief details of modelling results for the Adur	Yes		Shows location of cross sections and brief details of modelling results for the Adur	Unverified data
Ground_Water_Vulnerability_100	From information provided by EA	Polygon layer showing areas where data regarding groundwater vulnerability is available	Yes		Shows areas where data regarding groundwater vulnerability is available	
Lewes_flood_cell_4	From information provided by EA	Polygon layer showing flood cell 4 – North Street in Lewes	Yes		Shows flood cell 4 in Lewes	
Lower_Ouse	From information provided by EA	Point data layer providing location and brief details of cross sections used for modelling purposes	Yes		Shows location of cross sections used for hydraulic modelling purposes	
Major_High1	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by major aquifers and high leaching potential soil class 1	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Major_High2	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by major aquifers and high leaching potential soil class 2	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Major_High3	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by major aquifers and high leaching potential soil class 3	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Major_HighU	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by major aquifers and high leaching potential soil for restored mineral workings and urban areas	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
Major_I1	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by major aquifers and intermediate leaching potential soil class 1	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Major_I2	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by major aquifers and intermediate leaching potential soil class 2	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Major_L	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by major aquifers and low leaching potential soils	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Marshalling areas	From information provided by EA	Point data layer providing location of marshalling areas within Lewes District	Yes		Shows location of marshalling areas – flood emergency procedures	
Minor_High1	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by minor aquifers and high leaching potential soil class 1	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Minor_High2	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by minor aquifers and high leaching potential soil class 2	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Minor_High3	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by minor aquifers and high leaching potential soil class 3	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Minor_HighU	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by minor aquifers and high leaching potential soil for restored mineral workings and urban areas	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
Minor_I1	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by minor aquifers and intermediate leaching potential soil class 1	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Minor_I2	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by minor aquifers and intermediate leaching potential soil class 2	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
Minor_L	From Groundwater Vulnerability Map provided by EA	Polygon layer showing areas covered by minor aquifers and low leaching potential soils	Yes		Shows areas where infiltration techniques should be applied with caution	A site specific FRA will be needed to determine the applicability of SUDS techniques
MRO_1_XS_WL	From information provided by EA	Point data layer providing location of cross sections used for modelling and results of runs for various return periods along the Middle River Ouse	Yes		Shows location of cross sections used for modelling and results of runs for various return periods along the Middle River Ouse	Unverified data (1 of 2)
MRO_2_XS_WL	From information provided by EA	Point data layer providing location of cross sections used for modelling and results of runs for various return periods along the Middle River Ouse	Yes		Shows location of cross sections used for modelling and results of runs for various return periods along the Middle River Ouse	Unverified data (2 of 2)
Newhaven_flood_compartment_4	From information provided by EA	Polygon layer showing flood compartment 4 in Newhaven	Yes		Shows flood compartment 4 in Newhaven	
Ouse_Fluvial_ABD	From information provided by EA	Polygon layer (outline) showing areas along the fluvial part of the Ouse benefiting from flood defences	Yes		Shows areas benefiting from flood defences along the fluvial part of the Ouse	EA information. Not verified by FM
Ouse_Tidal_ABD	From information provided by EA	Polygon layer (outline) showing areas along the tidal part of the Ouse benefiting from flood defences	Yes		Shows areas benefiting from flood defences along the tidal part of the Ouse	EA information. Not verified by FM
SO_floodzone2_v3_3_Clip	From data provided by the EA	Polygon layer showing areas with medium probability of flooding	Yes		Indicates areas with medium probability of flooding	Unverified data

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
SO_floodzone3_v3_3_Clip	From data provided by the EA	Polygon layer showing areas at high risk of flooding	Yes		Indicates areas at high risk of flooding	Unverified data
Standard_1000yr	From information provided by EA	Polyline layer showing location and details of formal flood defences providing a standard of protection of 1000 years	Yes		Shows locations and details of formal flood defences providing a standard of protection of 1000 years	Source: NFCDD
Standard_100yr	From information provided by EA	Polyline layer showing location and details of formal flood defences providing a standard of protection of 100 years	Yes		Shows locations and details of formal flood defences providing a standard of protection of 100 years	Source: NFCDD
Standard_200yr	From information provided by EA	Polyline layer showing location and details of formal flood defences providing a standard of protection of 200 years	Yes		Shows locations and details of formal flood defences providing a standard of protection of 200 years	Source: NFCDD
Standard_2yr	From information provided by EA	Polyline layer showing location and details of formal flood defences providing a standard of protection of 2 years	Yes		Shows locations and details of formal flood defences providing a standard of protection of 2 years	Source: NFCDD
Standard_30yr	From information provided by EA	Polyline layer showing location and details of formal flood defences providing a standard of protection of 30 years	Yes		Shows locations and details of formal flood defences providing a standard of protection of 30 years	Source: NFCDD
Standard_50yr	From information provided by EA	Polyline layer showing location and details of formal flood defences providing a standard of protection of 50 years	Yes		Shows locations and details of formal flood defences providing a standard of protection of 50 years	Source: NFCDD
Standard_5yr	From information provided by EA	Polyline layer showing location and details of formal flood defences providing a standard of protection of 5 years	Yes		Shows locations and details of formal flood defences providing a standard of protection of 5 years	Source: NFCDD
Standard_unknown	From information provided by EA	Polyline layer showing location and details of flood defences providing an unknown standard of protection	Yes		Shows locations and details of flood defences providing an unknown standard of protection	Source: NFCDD

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
Structures	From NFCDD information provided by the EA	Point data layer providing location and details of Water Management Structures	Yes		Shows location and details of existing water management structures	Source: NFCDD
URO_1_XS_WL	From information provided by EA	Point data layer providing location of cross sections used for modelling and results of runs for various return periods along the Upper River Ouse	Yes		Shows location of cross sections used for modelling and results of runs for various return periods along the Upper River Ouse	Unverified data (1 of 3)
URO_2_XS_WL	From information provided by EA	Point data layer providing location of cross sections used for modelling and results of runs for various return periods along the Upper River Ouse	Yes		Shows location of cross sections used for modelling and results of runs for various return periods along the Upper River Ouse	Unverified data (2 of 3)
URO_3_XS_WL	From information provided by EA	Point data layer providing location of cross sections used for modelling and results of runs for various return periods along the Upper River Ouse	Yes		Shows location of cross sections used for modelling and results of runs for various return periods along the Upper River Ouse	Unverified data (3 of 3)
Watercourses	From information provided by EA	Polyline layer showing all watercourses within the District	Yes		Shows all watercourses in Lewes District (main rivers, COWs and other streams)	
xsecs_framfield	From information provided by EA	Point data layer providing location and brief details of cross sections used for modelling purposes	Yes		Shows location of cross sections used for hydraulic modelling purposes.	Area covered: Framfield Stream
Xsecs_Glynde_Nor	From information provided by EA	Point data layer providing location and brief details of cross sections used for modelling purposes	Yes		Shows location of cross sections used for hydraulic modelling purposes.	Area covered: Glynde Norlington

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
xsecs_Goldbridge_Ardingly	From information provided by EA	Point data layer providing location and brief details of cross sections used for modelling purposes	Yes		Shows location of cross sections used for hydraulic modelling purposes	Area covered: Goldbridge Ardingly
Xsecs_Ouse_Uck	From information provided by EA	Point data layer providing location and brief details of cross sections used for modelling purposes	Yes		Shows location of cross sections used for hydraulic modelling purposes	Area covered: River Ouse – River Uck
xsecs_tickeridge_stream	From information provided by EA	Point data layer providing location and brief details of cross sections used for modelling purposes	Yes		Shows location of cross sections used for hydraulic modelling purposes	Area covered: Tickeridge Stream
Structure_information	From information provided by ESCC	Point data layer providing location and brief details of bridges and culverts within the District	Partial		Shows location and brief details of bridges and culverts within the District	No level data available. (1 of 3)
Structure_information_#2format	From information provided by ESCC	Point data layer providing location and brief details of bridges and culverts within the District	Partial		Shows location and brief details of bridges and culverts within the District	No level data available. (2 of 3)
Structure_information_#3format	From information provided by ESCC	Point data layer providing location and brief details of bridges and culverts within the District	Partial		Shows location and brief details of bridges and culverts within the District	No level data available. (3 of 3)
#YR-10M_EXISTING_MHWS_d_ g005_Max	From hydraulic modelling carried out by FM	Point data layer providing results of depth of flooding modelling	Yes		Shows results of maximum depth of flooding for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
#YR-10M_EXISTING_MHWS_V_ g005_Max	From hydraulic modelling carried out by FM	Point data layer providing results of velocity of flooding modelling	Yes		Shows results of maximum velocity of flooding for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
#YR-10M_EXISTING_MHWS_fd_max	From hydraulic modelling carried out by FM	Point data layer providing results of Safe access and exit analysis (FD2320)	Yes		Shows results of Safe access and exit analysis (FD2320) for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
EXISTING_#YR_MHWSonset	From hydraulic modelling carried out by FM	Point data layer providing results of rate of onset of flooding modelling	Yes		Shows results of rate of onset of flooding for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
EXISTING_#YR_MHWSdur	From hydraulic modelling carried out by FM	Point data layer providing results of duration of flooding modelling	Yes		Shows results of duration of flooding for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
#YR-10M_RAISED_DEFENCE_MHWS _d_g005_Max	From hydraulic modelling carried out by FM	Point data layer providing results of depth of flooding modelling	Yes		Shows results of maximum depth of flooding for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
#YR-10M_ RAISED_DEFENCE _MHWS_V_g005_Max	From hydraulic modelling carried out by FM	Point data layer providing results of velocity of flooding modelling	Yes		Shows results of maximum velocity of flooding for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
#YR-10M_ RAISED_DEFENCE _MHWS_fd_max	From hydraulic modelling carried out by FM	Point data layer providing results of Safe access and exit analysis (FD2320)	Yes		Shows results of Safe access and exit analysis (FD2320) for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
RAISED_DEFENCE _#YR_MHWSonset	From hydraulic modelling carried out by FM	Point data layer providing results of rate of onset of flooding modelling	Yes		Shows results of rate of onset of flooding for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
RAISED_DEFENCE _#YR_MHWSdur	From hydraulic modelling carried out by FM	Point data layer providing results of duration of flooding modelling	Yes		Shows results of duration of flooding for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
#YR-10M_UNDEFENDED_MHWS_d_ g005_Max	From hydraulic modelling carried out by FM	Point data layer providing results of depth of flooding modelling	Yes		Shows results of maximum depth of flooding for #YR return period	100yr Return period
#YR-10M_ UNDEFENDED _MHWS_V_g005_Max	From hydraulic modelling carried out by FM	Point data layer providing results of velocity of flooding modelling	Yes		Shows results of maximum velocity of flooding for #YR return period	100yr Return period
#YR-10M_ UNDEFENDED _MHWS_fd_max	From hydraulic modelling carried out by FM	Point data layer providing results of Safe access and exit analysis (FD2320)	Yes		Shows results of Safe access and exit analysis (FD2320) for #YR return period	100yr Return period
UNDEFENDED _#YR_MHWSonset	From hydraulic modelling carried out by FM	Point data layer providing results of rate of onset of flooding modelling	Yes		Shows results of rate of onset of flooding for #YR return period	100yr Return period

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
UNDEFENDED _#YR_MHWSdur	From hydraulic modelling carried out by FM	Point data layer providing results of duration of flooding modelling	Yes		Shows results of duration of flooding for #YR return period	100yr Return period
#YR-mhws-dif	From hydraulic modelling carried out by FM	Point data layer providing the difference between existing and raised defences in depth of flooding modelling	Yes		Shows results of the difference in depth of flooding between existing and raised defences for #YR return period	Range of return periods (100yr 100yr+20%, 1000yr)
NEWHAVEN_SFRA_#YR_ #YRTIDE_EXIST_d_g010_Max	From hydraulic modelling carried out by FM	Point data layer providing results of depth of flooding modelling	Yes		Shows results of maximum depth of flooding for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_#YR_ #YRTIDE_EXIST_V_g010_Max	From hydraulic modelling carried out by FM	Point data layer providing results of velocity of flooding modelling	Yes		Shows results of maximum velocity of flooding for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_#YR_#YRTIDE_EXIST_fd_max	From hydraulic modelling carried out by FM	Point data layer providing results of Safe access and exit analysis (FD2320)	Yes		Shows results of Safe access and exit analysis (FD2320) for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_#YR_#YRTIDE_EXISTonset	From hydraulic modelling carried out by FM	Point data layer providing results of rate of onset of flooding modelling	Yes		Shows results of rate of onset of flooding for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_#YR_#YRTIDE_EXISTdur	From hydraulic modelling carried out by FM	Point data layer providing results of duration of flooding modelling	Yes		Shows results of duration of flooding for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_#YR_#YRTIDE_ RAISEDDEFENCE_d_g010_Max	From hydraulic modelling carried out by FM	Point data layer providing results of depth of flooding modelling	Yes		Shows results of maximum depth of flooding for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
NEWHAVEN_SFRA_#YR_#YRTIDE_ RAISEDDEFENCE_V_g010_Max	From hydraulic modelling carried out by FM	Point data layer providing results of velocity of flooding modelling	Yes		Shows results of maximum velocity of flooding for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_#YR_#YRTIDE_ RAISEDDEFENCE_fd_max	From hydraulic modelling carried out by FM	Point data layer providing results of Safe access and exit analysis (FD2320)	Yes		Shows results of Safe access and exit analysis (FD2320) for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_#YR_#YRTIDE_ RAISEDDEFENCEonset	From hydraulic modelling carried out by FM	Point data layer providing results of rate of onset of flooding modelling	Yes		Shows results of rate of onset of flooding for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_#YR_#YRTIDE_ RAISEDDEFENCEdur	From hydraulic modelling carried out by FM	Point data layer providing results of duration of flooding modelling	Yes		Shows results of duration of flooding for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
NEWHAVEN_SFRA_2YR_200YRTIDE_ UNDEFENDED_d_g010_Max	From hydraulic modelling carried out by FM	Point data layer providing results of depth of flooding modelling	Yes		Shows results of maximum depth of flooding for 2YR fluvial return period and 200YR tidal return period	2yr Fluvial return period + 200yr tidal return period
NEWHAVEN_SFRA_2YR_200YRTIDE_ UNDEFENDED_V_g010_Max	From hydraulic modelling carried out by FM	Point data layer providing results of velocity of flooding modelling	Yes		Shows results of maximum velocity of flooding for 2YR fluvial return period and 200YR tidal return period	2yr Fluvial return period + 200yr tidal return period
NEWHAVEN_SFRA_2YR_200YRTIDE_ UNDEFENDED_fd_max	From hydraulic modelling carried out by FM	Point data layer providing results of Safe access and exit analysis (FD2320)	Yes		Shows results of Safe access and exit analysis (FD2320) for 2YR fluvial return period and 200YR tidal return period	2yr Fluvial return period + 200yr tidal return period
NEWHAVEN_SFRA_2YR_200YRTIDE_ UNDEFENDEDonset	From hydraulic modelling carried out by FM	Point data layer providing results of rate of onset of flooding modelling	Yes		Shows results of rate of onset of flooding for 2YR fluvial return period and 200YR tidal return period	2yr Fluvial return period + 200yr tidal return period

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
NEWHAVEN_SFRA_2YR_200YRTIDE_ UNDEFENDEDdur	From hydraulic modelling carried out by FM	Point data layer providing results of duration of flooding modelling	Yes		Shows results of duration of flooding for 2YR fluvial return period and 200YR tidal return period	2yr Fluvial return period + 200yr tidal return period
NEWHAVEN_SFRA_#YR_#YRTIDE_d_g010_diff	From hydraulic modelling carried out by FM	Point data layer providing the difference between existing and raised defences in depth of flooding modelling	Yes		Shows results of the difference in depth of flooding between existing and raised defences for #YR fluvial return period and #YR tidal return period	Range of return periods (2yr fluvial + 200yr tidal; 2yr fluvial + 1000yr tidal; and 20yr fluvial + 20yr tidal)
dem_5m-5_5_MHWS(2115)	From hydraulic modelling carried out by FM	Point data layer providing results of depth of flooding modelling	Yes		Shows results of maximum depth of flooding for 200YR tidal return period in 2115	
dem_5m-5_5_MHWS(2115)-defended	From hydraulic modelling carried out by FM	Point data layer providing results of depth of flooding modelling	Yes		Shows results of maximum depth of flooding for 200YR tidal return period in 2115	
fd2320_Legend	From hydraulic modelling carried out by FM	Legend to accompany FD2320 – Safe Access and Exit Analysis	Yes		Legend to accompany FD2320 – Safe Access and Exit Analysis	FD2320 – Safe Access and Exit Lookup Table used for the assessment. (Refer to Appendix E)
diff_Legend	From hydraulic modelling carried out by FM	Legend to accompany Depth Difference results	Yes		Legend to accompany Depth Difference results	
Flow_Depth_Legend	From hydraulic modelling carried out by FM	Legend to accompany Maximum Depth of Flooding results	Yes		Legend to accompany Maximum Depth of Flooding results	
Flow_Velocity_Legend	From hydraulic modelling carried out by FM	Legend to accompany Maximum Velocity of Flooding results	Yes		Legend to accompany Maximum Velocity of Flooding results	
Lewes-onset_Legend	From hydraulic modelling carried out by FM	Legend to accompany Rate of Onset results	Yes		Legend to accompany Rate of Onset results	
Lewes-dur_Legend	From hydraulic modelling carried out by FM	Legend to accompany Duration of Flooding results	Yes		Legend to accompany Duration of Flooding results	
Newhaven_depth_Legend	From hydraulic modelling carried out by FM	Legend to accompany Maximum Depth of Flooding results	Yes		Legend to accompany Maximum Depth of Flooding results	

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
Newhaven_vel_Legend2	From hydraulic modelling carried out by FM	Legend to accompany Maximum Velocity of Flooding results	Yes		Legend to accompany Maximum Velocity of Flooding results	
newhaven-onset_Legend	From hydraulic modelling carried out by FM	Legend to accompany Rate of Onset results	Yes		Legend to accompany Rate of Onset results	
newhaven-duration_Legend	From hydraulic modelling carried out by FM	Legend to accompany Duration of Flooding results	Yes		Legend to accompany Duration of Flooding results	
Lewes_flood_compartment_number	From information provided by LDC	Point data layer to accompany flood cells outlines provided by EA	Yes		Shows IDs of flood cells in Lewes	
Newhaven_flood_compartments	From information provided by EA	Polygon layer providing outlines of flood compartments for Newhaven	Yes		Shows flood compartments in Newhaven	Created from data provided by EA
Climate Change Outline	From hydraulic modelling carried out by FM	Polygon layer providing outlines of extent of flooding	Yes		Shows flood outlines for the 1 in 1000yr + 20% scenario	
Dry riverbed	From Hydrogeological map	Polygon layer providing location	Yes		Shows identified areas that would remain dry but would act as river beds/ponds in times of flooding	
Peacetime_Emergency_Flood_Assessment	From information provided by LDC	Point data layer providing details of emergency procedures in place during times of flooding	Yes		Details of peacetime emergency procedures during times of flooding	
points 25yr	From information obtained from hydraulic modelling	Polygon layer providing functional floodplain outline	Yes		Shows functional floodplain (1 in 25 years Return Period)	
Springs	From Hydrogeological map	Point data layer providing estimated location of springs	Yes		Shows areas where springs are found	To be complemented with results of Flood1 study
Ancient_Monuments	From information provided by LDC	Point data layer providing location and local plan reference	Yes		Shows ancient monuments	Part of Local Plan
AONB	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Area of Outstanding Natural Beauty	Part of Local Plan

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
Archaeological_Interest	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Area of Archaeological interest	Part of Local Plan
Clay	From Geology map for the area	Polygon layer providing location and details	Yes		Shows areas identified as having clay as superficial soil and therefore being not effective for infiltration techniques	A site specific FRA will be needed to determine the applicability of SUDS techniques
Contaminated Land	From information provided by LDC	Polygon layer providing location of potentially contaminated areas	Yes		Shows land identified as potentially contaminated as a result of previous use	Potentially Contaminated Land
ESA	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Environmentally Sensitive Areas	Part of Local Plan
Historic_Battlefields	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Historic Battlefields	Part of Local Plan
Historic_Parks_and_Gardens	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Historic Parks and Gardens	Part of Local Plan
Landfill Sites	From information provided by LDC	Polygon layer providing location and some information	Yes		Shows recognised landfill sites	
LDC_Ancient_Woodland	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Ancient Woodland	Part of Local Plan
ldcarea	From information provided by LDC	Polygon layer showing District Council Boundaries	Yes		Indicates District Boundary	
Local_Nature_Reserves	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Local Nature Reserves	Part of Local Plan
MM_AREA	From information provided by LDC	Polyline layer showing OS Background	Yes		OS Background	
MM_ANNO	From information provided by LDC	Point data layer providing text for OS Background	Yes		Text for OS Background	
National_Nature_Reserves_Clip	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows National Nature Reserves	Part of Local Plan

Table Name	Identification Method	GIS Description	Complete	Reason	Table Description	Comments
parish_bnds	From information provided by LDC	Polygon layer providing location of parishes within the District	Yes		Shows parish boundaries within Lewes District	
Proposed_National_Park	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Proposed National Park	Part of Local Plan
Reservoirs	From information provided by LDC	Point data layer providing location and brief details of reservoirs	Yes		Shows location and some details of reservoirs in operation in the District	An assessment of the potential flood risk created by reservoirs is carried out by the EA on a regular basis.
SEWER_LINE	From information provided by LDC	Polyline layer providing location and dimensions of sewers	Yes		Shows location and details of sewers	
sewers_diam_over_500mm	From information provided by LDC	Polyline layer providing location of main trunk sewers	Yes		Shows location and details of main trunk sewers diameter>500mm	
SNCI	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows sites of nature conservation importance	Part of Local Plan
Special_Areas_Of_Conservation	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows special areas of conservation	Part of Local Plan
SSSI	From information provided by LDC	Polygon layer providing location and local plan reference	Yes		Shows Sites of Specific Scientific Interest	
Lewes Flooding_List	From information provided by SW	Point data layer providing location and details of sewer related flooding	Partial	Only last decade provided	Shows location and details of sewer related flooding over last 10 years	

Appendix B: Document Management Guide

B.1.1. PPS25 highlights the importance of maintaining Strategic Flood Risk Assessments as "Live Documents" and recommends regular reviews to ensure its appropriateness. To facilitate the process, a summary of the main aspects to be taken into consideration during the strategic assessment of flood risk has been prepared and is presented in the following table.

Table B. 1 Summary of Main Aspects to be considered during Maintenance of SFRA

Area Covered	Source of Information	Provider	Comments	Next Review
Flood Zones	Hydraulic Models of main rivers in the area (fluvial) and extreme sea levels (tidal)	EA	FM produced outlines based on river modelling	When further modelling is carried out and/or outlines reviewed by EA. Check flood map CD (EA)
Flood Defences and Water Management Structures	NFCDD data	EA		Next issue of NFCDD CD or following completion of FAS.
Flooding History	Stakeholders records	LDC, EA, SW		Next general review of SFRA
Flood Warning Areas	EA Database	EA		When further modelling is carried out. Check flood map CD (EA)
Ordnance Survey Background	Ordnance Survey	LDC	-	Next general review of SFRA
Local Plan Information	Local Plan	LDC	Local Plan 2003	Next issue of Local Plan
Areas benefiting from Defences	EA Database	EA		When further modelling is carried out following completion of FAS.
Groundwater	Geology and Groundwater Vulnerability	EA	-	When "Flood 1" study is available
Artificial Sources	Stakeholders records	EA, LDC	Little data from EA	When full access to data is granted by EA
Sewers	Stakeholders records	SW, LDC	No details provided by SW	When full access to data is granted by SW
Overland Flow	LIDAR and Contour Data	LDC	-	When LIDAR data for whole District is available.

B.1.2. The following table represents our suggested schedule of maintenance.

Table B.2: Recommended Schedule of Maintenance

Date	Activity
December 2007	Issue of Level 1 and 2 Draft Report
May 2009	Issue of Revised Draft Report
June 2009	Issue of Level 1 and 2 Final Report
(2010-2011)	Annual Interim Reviews To incorporate any major changes in terms of flood management infrastructure and any flooding incidents
2012	General Review (every three years) To re-evaluate flood risk and planning policies according to latest legislation.

B.1.3. It is essential that any updates of the SFRA are recorded in a structured manner. To facilitate this task, the following table has been created.

Lewes District Council
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STRATEGIC FLOOD RISK ASSESSMENT REVIEW				
Type of Review:	**Scheduled** ☐	**Interim** ☐	**Date of Review:**	
Reviewer Name:			**Organisation:**	
Area Reviewed	**Source of Information**	**Provider**	**Maps Modified**	**Comments**

Appendix C: Planning Policy and Flood Risk

Planning Policy Statement 25 (PPS25)

C.1.1. Planning Policy Statement 25 (PPS25) defines four distinct zones of flood risk. These zones are based on the quantified degree of flood risk to which an area of land is subject at the time at which a land allocation decision is made or a planning application submitted. The PPS25 flood risk zones and their associated flood risk characterisations are summarised in the table below

Table C.1: Flood Zones – Risk and Probability

Zone	Character of Risk	Assigned annual Flood Risk Probabilities
1	Low Probability	Less than 0.1% (above 1 in 1000 years)
2	Medium Probability	Rivers: between 1% (1 in 100 years) and 0.1% (1 in 1000 years) Sea: between 0.5% (1 in 200 years) and 0.1% (1 in 1000 years)
3a	High Probability	Rivers: greater than 1% (1 in 100 years) Sea: greater than 0.5% (1 in 200 years)
3b	Functional Floodplain	Greater than 4% (1 in 25 years – *Adopted for Lewes)*

C.1.2. The PPS25 flood risk zones give a broad indication of flood risk. However, most areas which fall within the High Risk zone (zones 3a and 3b) already enjoy some degree of protection from established flood defences. The actual degree of flood risk to which these areas are subject may well be significantly less than that implied by their PPS25 classification, provided of course that those defences are adequately maintained.

C.1.3. PPS25 requires Local Planning Authorities to adopt a risk-based approach to development in areas at risk of flooding, and to apply a "Sequential Test" to such areas. This means that, other factors being equal, the planning authority should favour development in areas with the lower flood risk.

C.1.4. PPS25 sub-divides the "High Risk" Zone 3, as summarised below

Zone 3a – High Probability

C.1.5. Areas generally not suitable for residential, commercial and industrial development unless a particular location is essential for a specific use and an alternative lower risk location is not available. Development should only be permitted in this zone if the Exception Test is passed.

Zone 3b – The Functional Floodplain

C.1.6. Areas possibly suitable for some recreation, sport, amenity or conservation uses. Built development in these areas should be wholly exceptional and limited to essential infrastructure. Development should only be permitted in this zone if the Exception Test is passed.

C.1.7. PPS25 defines functional floodplains as "land where water has to flow or be stored in times of flood”. A functional floodplain can be either an area of floodplain which is known to flood frequently and where flooding is tolerated, as it may prevent or ameliorate flooding elsewhere, or an area within a floodplain that can be deliberately inundated during a flood event to provide temporary retention storage for flood water. Functional floodplain relates only to river and coastal flooding.

C.1.8. PPS25 creates a policy framework within which all those involved in the planning process can actively contribute to a more sustainable approach to managing flood risk. This provides opportunities to:

- factor flood risk into planning decisions from the outset of the spatial planning process
- ensure that these decisions fully consider the implications of climate change
- provide greater clarity and certainty to developers regarding which sites are suitable for developments of different types
- develop local authority, developer and community-led initiatives to reduce flood risk in a manner that also enhances the environment
- ensure that both the direct and cumulative impacts of development on flood risk are acknowledged and appropriately mitigated

- adopt a catchment-wide approach
- develop integrated, sustainable developments which deliver multiple benefits.

Flood Risk Vulnerability

C.1.9. As part of the initiative to promote appropriate development for the different flood risk zones, PPS25 has classified infrastructure in terms of its vulnerability to flood risk as detailed below.

Essential Infrastructure: Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk, and strategic utility infrastructure, including electricity generating power stations and grid and primary substations.

Highly Vulnerable:

- Police stations, Ambulance stations and Fire stations and Command Centres and telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent.

More Vulnerable:

- Hospitals.
- Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels.
- Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels.
- Non–residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

Less Vulnerable

- Buildings used for: shops; financial, professional and other services; restaurants and cafes; hot food takeaways; offices; general industry; storage and distribution; non–residential institutions not included in ‘more vulnerable’; and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment plants.
- Sewage treatment plants (if adequate pollution control measures are in place).

Water-compatible Development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel workings.
- Docks, marinas and wharves.
- Navigation facilities.
- MOD defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, subject to a specific warning and evacuation plan.

C.1.10. The above classification is based partly on DEFRA/Environment Agency research on Flood Risks to People and also on the need of some uses to keep functioning during flooding.

C.1.11. When buildings combine a mixture of uses, these should be placed into the higher of the relevant classes of flood risk sensitivity.

C.1.12. Developments that allow various uses to be spread over the site may fall within several classes of flood risk sensitivity.

C.1.13. The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

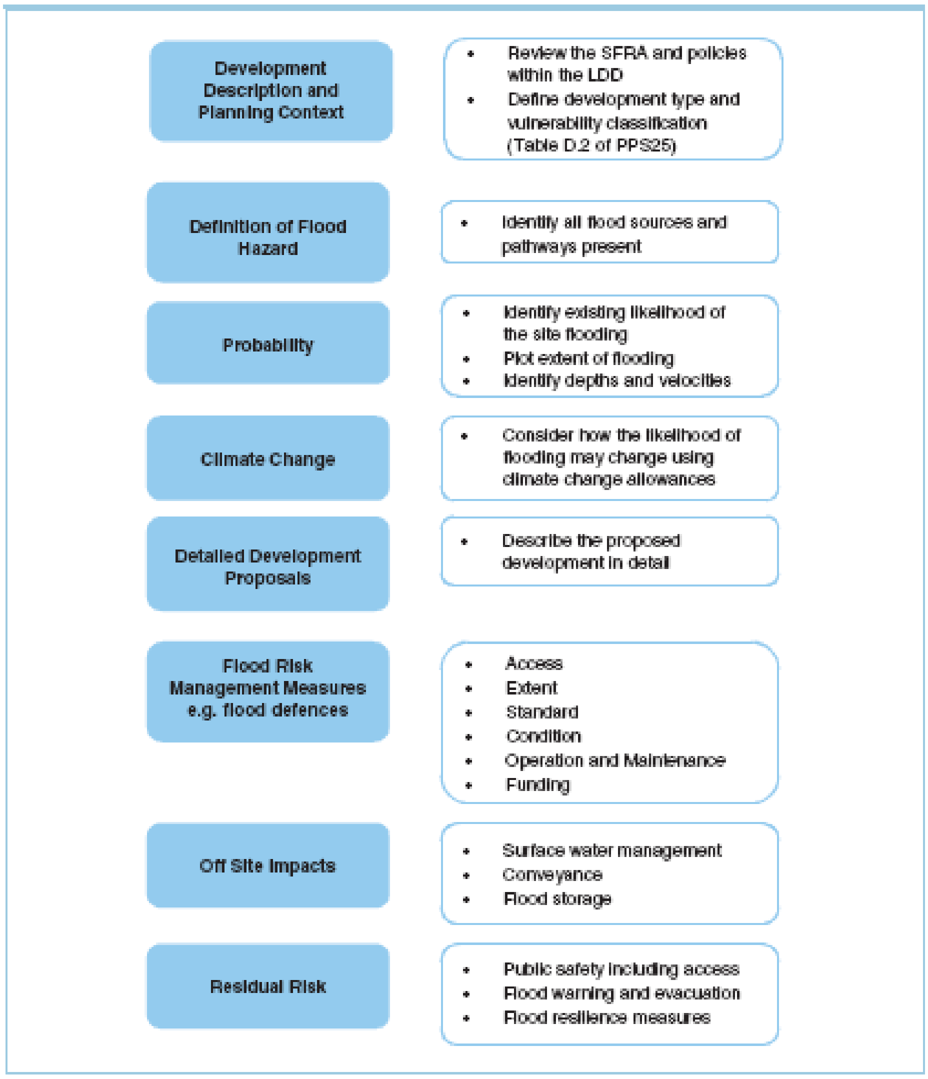
Site Specific Flood Risk Assessments (FRA)

C.1.14. It is mandatory that an assessment of flood risk is carried out for any proposed development site within Flood Zones 2, 3a and 3b and for large developments (area >1ha) within Flood Zone 1. The FRA will inform the decision-making process at all stages of development planning.

C.1.15. It is the responsibility of any organisation or person proposing a development to carry out a site-specific flood risk assessment. The FRA must consider whether or not the proposed development will add to flood risk. Where possible proposed development should seek to reduce flood risk. The future users of the development must not be placed in danger from flood hazards and should remain safe throughout the lifetime of the plan or proposed development/land use.

C.1.16. The requirements for a site specific flood risk assessment vary depending on the location of the proposed development site in relation to the various flood zones identified in this study and the history of flooding in the area from secondary sources. The general scope of a FRA is shown in the following schematic.

Figure C.1: Scope of Site-Specific Flood Risk Assessment



(Source: PPS25 Companion Guide)

C.1.17. At all stages of the planning process, the minimum requirements for flood risk assessments are that they should:

- be proportionate to the risk and appropriate to the scale, nature and location of the development;
- consider the risk of flooding arising from the development in addition to the risk of flooding to the development;
- take the impacts of climate change into account (as per Annex B of PPS25);
- be undertaken by competent people, as early as possible in the particular planning process, to avoid misplaced effort and raising landowner expectations where land is unsuitable for development;
- consider both the potential adverse and beneficial effects of flood risk management infrastructure including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure;
- consider the vulnerability of those that could occupy and use the development, taking account of the Sequential and Exception Tests and the vulnerability classification (as per Annex D of PPS25 (see Appendix E)), including arrangements for safe access;
- consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;

- consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;
- include the assessment of the remaining (known as 'residual') risk (as per Annex G of PPS25) after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular development or land use;
- consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of development may affect drainage systems; and
- be supported by appropriate data and information, including historical information on previous events.

Flood Risk Zones – Policies

C.1.18. PPS25 set outs planning policies for the different flood risk zones identified as part of this study as described below.

Zone 1 Low Probability

C.1.19. This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%).

C.1.20. All uses of land are appropriate in this zone.

C.1.21. In addition to the minimum requirements for FRA included in paragraph C.1.17 of this Appendix, the following aspects should be taken into consideration as part of the flood risk assessment for proposed development sites within this area:

- Local Considerations: The FRA must contain an overview of the proposed development site including its location, geology, access routes and should identify potential issues in the area such as contaminated land, mines, brown fields, pits, etc.
- Existing Flood Risk: The FRA must establish the site's vulnerability to flooding from all possible sources.
- Effects of Proposed Works: The FRA must provide an analysis of the effect of the development on flood risk elsewhere by looking at aspects such as surface runoff increase, sewer capacity demands, flash flooding due to adjacent land, groundwater and any other local considerations.
- Mitigation: The FRA must include details of any mitigation measures proposed for the development. These should where possible involve the implementation of Sustainable Drainage Systems (SUDS).

C.1.22. Planning policy indicates that developers and local authorities should aim to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the application of suitable sustainable drainage techniques.

Zone 2 Medium Probability

C.1.23. This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% – 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% – 0.1%) in any year.

C.1.24. The water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure, as described in the Flood Risk Vulnerability section, are appropriate in this zone. Subject to the Sequential Test being applied, the highly vulnerable uses are only appropriate in this zone if the Exception Test is passed.

C.1.25. In addition to the minimum requirements for FRA included in paragraph C.1.17 of this Appendix, the following aspects should be taken into consideration as part of the flood risk assessment for proposed development sites within this area:

- Local Considerations: The FRA must contain an overview of the proposed development site including its location, geology, access routes and should identify potential issues in the area such as contaminated land, mines, brown fields, pits, etc.
- Existing Flood Risk: The FRA must establish the site's vulnerability to flooding from all possible sources. Special attention must be placed on fluvial and coastal flooding.

- Effects of Proposed Works: The FRA must provide an analysis of the effect of the development on flood risk elsewhere by looking at aspects such as loss of floodplain, surface runoff increase, sewer capacity demands, flash flooding due to adjacent land, groundwater and any other local considerations.
- Mitigation: The FRA must include details of any mitigation measures proposed for the development. These should where possible involve the implementation of Sustainable Drainage Systems (SUDS).
- Finished Floor Levels: The FRA must incorporate the recommendations from the EA and local authorities with regards to acceptable floor levels for the development.
- Emergency Access/Egress: The FRA must provide a clear indication of a safe route to be followed by emergency services during times of flooding. This route must comply with the EA minimum requirements.

C.1.26. Planning policy indicates that developers and local authorities should seek a reduction in the overall level of flood risk in the area and beyond through the layout and form of the development, and the application of appropriate sustainable drainage methods.

Zone 3a High Probability

C.1.27. This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

C.1.28. The water-compatible and less vulnerable uses of land, as described in the Flood Risk Vulnerability section, are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

C.1.29. In addition to the minimum requirements for FRA included in paragraph C.1.17 of this Appendix, the following aspects should be taken into consideration as part of the flood risk assessment for proposed development sites within this area:

- Local Considerations: The FRA must contain an overview of the proposed development site including its location, geology, access routes and should identify potential issues in the area such as contaminated land, mines, brown fields, pits, etc.
- Existing Flood Risk: The FRA must establish the site's vulnerability to flooding from all possible sources. Special attention must be placed on fluvial and coastal flooding.
- Effects of Proposed Works: The FRA must provide an analysis of the effect of the development on flood risk elsewhere by looking at aspects such as loss of floodplain, surface runoff increase, sewer capacity demands, flash flooding due to adjacent land, groundwater and any other local considerations.
- Mitigation: The FRA must include details of any mitigation measures proposed for the development. These should where possible involve the implementation of Sustainable Drainage Systems (SUDS). It may be necessary for the developer to carry out improvements to the existing flood management structures or, when necessary, provide new ones.
- Finished Floor Levels: The FRA must incorporate the recommendations from the EA and local authorities with regards to acceptable floor levels for the development.
- Emergency Access/Egress: The FRA must provide a clear indication of a safe route to be followed by emergency services during times of flooding. This route must comply with the EA minimum requirements.

C.1.30. Planning policy indicates that developers and local authorities should aim to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques;
- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b The Functional Floodplain

C.1.31. This zone comprises land where water has to flow or be stored in times of flood. This study identifies this Flood Zone as land which would flood with an annual probability of 1 in 25 (4%) or greater in any year.

C.1.32. Only the water-compatible uses and the essential infrastructure, as described in the Flood Risk Vulnerability section, should be permitted in this zone. Essential infrastructure in this zone should pass the Exception Test. Any proposed development in this area should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

C.1.33. In addition to the minimum requirements for FRA included in paragraph C.1.17 of this Appendix, the following aspects should be taken into consideration as part of the flood risk assessment for proposed development sites within this area:

- Local Considerations: The FRA must contain an overview of the proposed development site including its location, geology, access routes and should identify potential issues in the area such as contaminated land, mines, brown fields, pits, etc.
- Existing Flood Risk: The FRA must establish the site's vulnerability to flooding from all possible sources. Special attention must be placed on fluvial and coastal flooding.
- Effects of Proposed Works: The FRA must provide an analysis of the effect of the development on flood risk elsewhere by looking at aspects such as loss of floodplain, surface runoff increase, sewer capacity demands, flash flooding due to adjacent land, groundwater and any other local considerations.
- Mitigation: The FRA must include details of any mitigation measures proposed for the development. These should where possible involve the implementation of Sustainable Drainage Systems (SUDS). It may be necessary for the developer to carry out improvements to the existing flood management structures or, when necessary, provide new ones.
- Finished Floor Levels: The FRA must incorporate the recommendations from the EA and local authorities with regards to acceptable floor levels for the development.
- Emergency Access/Egress: The FRA must provide a clear indication of a safe route to be followed by emergency services during times of flooding. This route must comply with the EA minimum requirements.

C.1.34. Planning policy indicates that developers and local authorities should endeavour to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; and
- relocate existing development to land with a lower probability of flooding.

Sustainable Drainage Systems (SUDS)

C.1.35. PPS25 emphasises the role of SUDS and introduces a general presumption that they will be used for all major developments.

C.1.36. Sustainable drainage is a design philosophy that uses a range of techniques to manage surface water as close to its source as possible. To produce a workable and effective scheme, SUDS must be incorporated into any proposed development at the earliest opportunity.

C.1.37. SUDS can be cost-effectively designed to form an integral part of hard and soft landscaped areas. In this way, they can contribute towards attractive schemes that enhance the nature conservation and amenity value of proposed development while also recycling the valuable water resource.

C.1.38. Consideration should be given to the arrangements for adoption and future maintenance of these systems. This is likely to influence the design just as much as technical considerations. It is recommended that maintenance of SUDS should be the responsibility of a publicly accountable body, which will often require the payment of a commuted sum or a legal agreement, possibly backed up by the deposit of a financial bond. The adopting organisation should approve any design before construction.

C.1.39. The applicability of Sustainable Drainage Systems varies depending on a series of factors such as type of soil, groundwater levels, land use, location in relation to flood zones, etc.

C.1.40. Some of the most commonly used sustainable drainage systems such as swales, trenches and permeable pavement rely on infiltration. However, there are situations where infiltration drainage is not appropriate, as indicated below:

- where poor runoff water quality may pose a pollution threat to groundwater resources
- where the infiltration capacity of the ground is low
- where groundwater levels are high
- where the stability of foundations may be at risk

C.1.41. For a soil to be suitable for accepting enhanced infiltration it must be permeable, unsaturated and of sufficient thickness and extent to disperse the water effectively.

C.1.42. The performance of infiltration systems will depend on the properties of the soil in which they are constructed. The capacity of the soil to infiltrate water can be described by using an infiltration coefficient which represents the long-term infiltration rate into the soil divided by the area of infiltration. In general terms, this will be high for coarse grained soils such as sands and gravels and low for fine soils such as silts and clays. The following table provides an indication of infiltration coefficients for different soil textures.

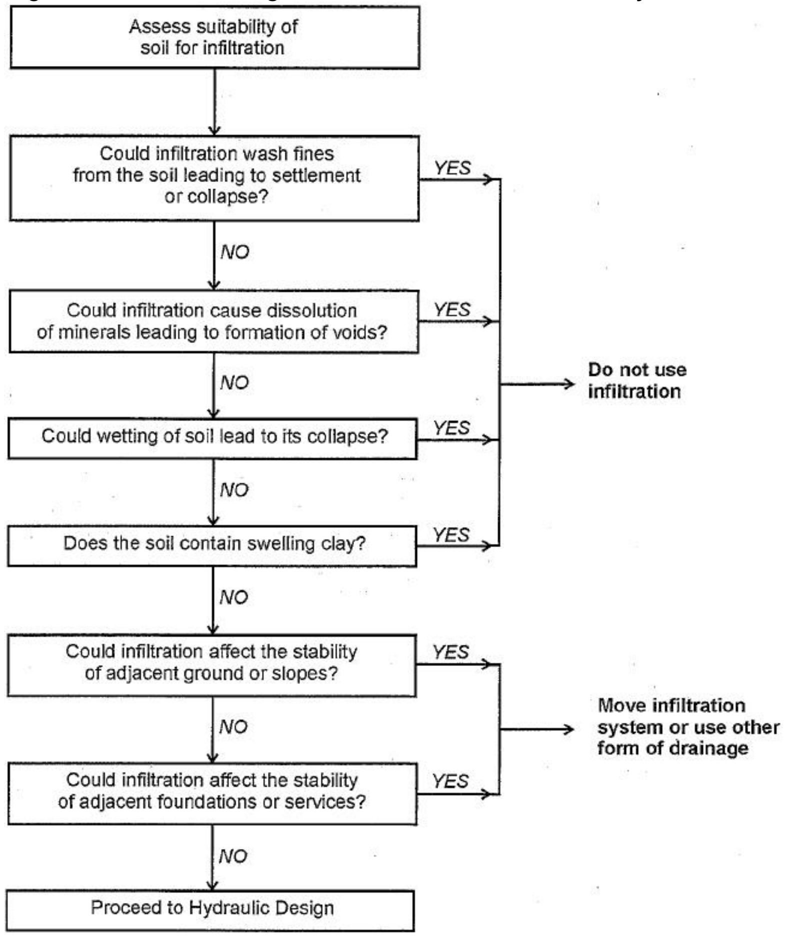
Table C.2: Typical Infiltration Coefficients based on soil texture

	Soil Type	**Typical Infiltration Coefficients (m/h)**
Good Infiltration	Gravel	10-1000
	Sand	0.1-100
	Loamy Sand	0.01-1
	Sandy Loam	0.05-0.5
	Loam	0.001-0.1
	Silt Loam	0.0005-0.05
	Chalk	0.0001-100
	Sandy Clay Loam	0.001-0.1
Poor Infiltration	Silty Clay Loam	0.00005-0.005
	Clay	<0.0001
	Till	0.00001-0.01
	Rock	0.00001-0.1

(Source: SUDS Manual)

C.1.43. For developments where infiltration techniques are proposed, a geotechnical investigation is likely to be required to ensure that the ground conditions are suitable and to check the likely performance of the infiltration method proposed. The following schematic provides a decision tree for the use of infiltration units.

Figure C.2: Decision guide for the use of infiltration systems



(Source: CIRIA C697)

C.1.44. The areas identified within Lewes District as unsuitable for the application of infiltration techniques are included in map 011. It must be noted that at this strategic level it is unrealistic to deem areas as appropriate for such techniques and it is recommended that such analysis is carried out at a site specific level.