Appendix D

Policy Appraisal Tables

Upper Thames			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**Maintain conveyance & the capacity of the natural floodplain, application of PPS25, maintain weirs, WLMPs**	**Removal of restrictions to flow in urban locations, BAP creation (assumes restrictions to flow are improved in 10 locations)**	**Resilience, Banbury FAS**	**P5 + Making Space for water (assumes storage in the Churn and Windrush along with 10% attenuation of flow generally)**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£11.21m	£46.53m	30.185 Not carrying out an annual clearance in some villages is likely to result in flooding most years, hence a large increase in damages.	£13.84m	£11.21m	£10m	£ 8.9m
	Number of properties at risk (1% AEP from MDSF)	3735 properties	6280	5328	4376	3735	3300	2700
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£1099k	0	£500k	£1099k	£1099k + £2.5 to £10m capital costs		£1099k + capital costs. At present the costs are unknown.
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	8404 people	14130	11988	9846	8404	7425	6075
	Vulnerable people at risk (SFVI 4 or 5)	2916 people	4946	4196	3446	2916	2599	2127
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	62.05km^2	<62.05	<62.05	62.05	+ or - 62.05	+ or - 62.05	>62.05
	Length of river restored (km)	1208km	0	0	0 to 10km	0 to 20km	0 to 20km	0 to 30km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Oxford Meadows SAC	-'ve Flooding for short periods in the winter when water levels are high are beneficial to parts of the site. However, certain drainage features do need to be maintained. The do nothing option would therefore have a negative impact	+'ve Flooding for short periods in the winter when water levels are high are beneficial to parts of the site (providing the drainage maintenance needed for the site is continued)	+'ve Flooding for short periods in the winter when water levels are high are beneficial to parts of the site	-'ve or neutral Flooding for short periods in the winter when water levels are high are beneficial to parts of the site. Reducing the probability of flooding at the site would have a negative impact. In practice this can be avoided.	-'ve or neutral Flooding for short periods in the winter when water levels are high are beneficial to parts of the site. Reducing the probability of flooding at the site would have a negative impact. In practice this can be avoided.	+'ve Flooding for short periods in the winter when water levels are high are beneficial to parts of the site.

To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	29 water dependent SSSIs	Neutral or Negative for 4 sites (in the Maintain some flooded areas group and Winter flooding group). Some benefits could arise for these sites from more regular flooding, however, they do require some management. For example, Infilling of ditches, drains, ponds, pools, marshes or pits degrades some of these sites and some management is required to prevent this. Negative for 4 sites (Maintain optimum water depths) as these sites are dependent upon intervention. Neutral for 20 sites (Maintain Drainage group). Neutral for the 3 groundwater dependent sites	Neutral or Positive for 4 sites (in the Maintain some flooded areas group and Winter flooding group). Neutral or Negative for 4 sites (Maintain optimum water depths) as these sites are dependent upon intervention. Neutral for 20 sites (Maintain Drainage group). Neutral for the 3 groundwater dependent sites	Neutral or Positive for 4 sites (in the Maintain some flooded areas group and Winter flooding group). Likely to be Neutral for 4 sites (Maintain optimum water depths). The condition of the one site in unfavourable and declining condition is not dependent upon flood risk management activity. Neutral for 20 sites (Maintain Drainage group). Neutral for the 3 groundwater dependent sites	In the Upper Thames the environmental impact of a P4 policy cf. a P3 policy is unlikely to differ. This is because P4 cannot be implemented by more watercourse maintenance (maintenance would have the largest direct impact on these sites). Neutral or Positive for 4 sites (in the Maintain some flooded areas group and Winter flooding group). Likely to be Neutral for 4 sites (Maintain optimum water depths). Neutral for 20 sites (Maintain Drainage group). Neutral for the 3 groundwater dependent sites	In theory, reducing the frequency of flooding would have Negative for for 4 sites (in the Maintain some flooded areas group and Winter flooding group). In practice, these negative impacts would be avoided as any structural measures to reduce the probability of flooding in the policy unit would not take place at or near these sites. Likely to be Neutral for 4 sites (Maintain optimum water depths).	Very Positive for 4 sites (in the Maintain some flooded areas group and Winter flooding group). Neutral to Positive for 4 sites (Maintain Optimum Water depths) Uncertain for all other sites.
			For the SSSI's in the Upper Thames the requirements for the different sites are detailed below. The headings for each of these groups of site have been used in the appraisal above. **Maintain some flooded areas** 2 sites (Otmoor and Whytham Ditches and Flushes) are floodplain grazing marsh with winter bird interest. A mosaic of unflooded, partially flooded and fully flooded areas needs to be maintained. Deepening of ditches should be avoided. Some areas should be flooded into the spring. Currently Whytham Ditches and Flushes is in favourable condition and Otmoor is 79% unfavourable and recovering. WLMP's are in place for both sites.					

			At these two sites modification of the structure of watercourses (eg streams, ditches, dykes, drains), including their banks and beds, as by re-alignment, re-grading and dredging may cause damage. **Winter flooding** 2 sites (Tuckmill Meadows and Whelford Meadows) where winter flooding is an important factor in the management of floodplain habitats and management should ensure the frequency and extent of flooding is appropriate for maintaining the nature conservation interest of the site. For example, river engineering has in many cases reduced the frequency and extent of flooding. Tuckmill Meadows is in unfavourable condition and recovering. WLMP's are in place for both sites. **Maintain optimum water depths** 4 sites (Cotswold Water Park, Blenheim Park, Wychwood and Otmoor) require the maintenance of optimum water depths. WLMP's are in place for the Cotswold Water Park and Otmoor. **Groundwater Dependent** 3 sites (Taynton Quarries, Weston Fen and Whytham Ditches and Flushes) that are flush and spring fen sites are groundwater dependent. At these sites the quantity and quality of the groundwater must be maintained, though the quantity is not likely to be naturally constant throughout the seasons or between wet and dry years. Drainage schemes should be designed not to intercept the source of groundwater to springs or flushes, or to reduce the area of surface they irrigate. **Maintain Drainage** 20 sites require regular and careful maintenance of surface drainage including ditches and drains as these can be necessary to prevent adverse changes in the plant species composition of the sward. At these sites the deepening of surface drainage should be avoided. For example the use of mole, tile, tunnel or other artificial drains should be avoided. These sites are all hay meadows or neutral grassland. 12 of these sites are in 100% favourable condition, 7 are in unfavourable condition but recovering and 1 is in unfavourable condition and declining. **Water Quality dependent** 1 site (Weston fen) is water quality dependent.

Swindon			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, PPS25 Sequential test resulting in no Greenfield development in floodplains and Greenfield rates of run-off being achieved in new development**	**P3 + Strategic application of PPS25 to achieve optimal layout and design of redevelopment in the river corridors through Swindon, Urban Drainage Planning, Planning for future flood resilience, Removal of restrictions to flow**	**P4 + and widespread adoption of resilience approaches**	**Not widely applicable in this policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£0.54m	£2.8m	£1.9m A large increase in damages is indicated with large reductions in maintenance. This is because there are numerous potential blockage	£0.8m	£0.54m	£0.49m (Assumes 10% penetration of flood resilience)	

				sites in Swindon.				
	Number of properties at risk (1% AEP from MDSF)	1027	1270	1240 to 5000 Reduction in development control activity could result in more properties in the floodplain because of the growth in this policy unit.	1210	1027	930 (Assumes 10% penetration of flood resilience)	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£310k	0	£150k	£310k	£310k Plus 1 FTE to facilitate and influence adaptation of the urban environment (£50k per year for at least five years) Capital costs of the removal of restrictions to flow are typically £0.1m to £1m depending upon their complexity. Assume £1m every ten years.	£310k Plus the cost of resilience measures. The cost of resilience is not known at present.	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	2311	2858	2790 to 11250	2723	2311	2093	
	Vulnerable people at risk (SFVI 4 or 5)	396	486	474 to 1913	463	396	356	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	6.14	6.14	6.14	> 6.14	> 6.14	> 6.14	
	Length of river restored (km)	2km of maintained channel that could be restored	0	0	Up to 1km	Up to 2km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	Up to 2km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Oxford			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, Enforcement, Application of PPS25, Safeguard the capacity of the upstream floodplain, Safeguard land that may be needed for future flood risk management purposes**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment (e.g. Oxpens, Osney Industrial Estate)**	**P4 + Flood resilience or upstream flood storage / flood alleviation channels**	**Not viable in Oxford**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	6.78	11.3	11.24	11.18	6.78	£2m to £3m	
	Number of properties at risk (1% AEP from MDSF)	5433	6334	6334	6334	5433	2000 to 4000 Capital options would reduce the risk for those properties at risk in the Thames floodplain.	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£300k	0	£250k There is only a small reduction in maintenance costs under P2 because of statutory duties to maintain levels for navigation.	£300k	£350k Plus 1 FTE to facilitate and influence adaptation of the urban environment (£50k per year for at least five years)	£350k Plus capital costs in the range of £5m to £10m for minor improvements to approx. £100m for a major storage or conveyance scheme	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	12224	11966	13109	14252	12224	4500 to 9000	
	Vulnerable people at risk (SFVI 4 or 5)	8422	8257	9045	9833	8422	3105 to 6210	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	1.93	<1.93	<1.93	1.93	1.93	+ or - 1.93 The impact of a scheme on the area of BAP habitat is entirely dependent upon the character of the scheme. Our aim would be to increase the quality and area of habitat	
	Length of river restored (km)	3	0	0	Up to 0.5km	Up to 1km	Up to 1km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						

To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	1 SSSI	Negative Hook Meadow and the Trap Grounds (in recovering condition) requires ditch maintenance.	Negative Hook Meadow and the Trap Grounds (in recovering condition) requires ditch maintenance.	Neutral to Positive Providing ditch maintenance continues.	Neutral to Positive Providing ditch maintenance continues.	Neutral to Positive Providing ditch maintenance continues.	Neutral to Positive Providing ditch maintenance continues.

Abingdon			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, Enforcement, Application of PPS25**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment, Removal of restrictions to flow**	**P4 + Possible flood alleviation measures eg upstream flood storage**	**Cannot be implemented in Abingdon**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	7.35	33.86	21.195 The Larkhill Stream and River Stert are very prone to blockages – hence the large increase in damages under P2.	8.53	7.35	£4.0m	
	Number of properties at risk (1% AEP from MDSF)	1822	1942	1930.5	1919	1822	1200	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£45k	0	£20k	£45k	£45k Plus capital costs to improve conveyance in the order of £1 to 2m	£45k Plus capital costs in the order of £2m to £5m for upstream storage and / or associated bunds on the River Ock	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	4100	4370	4344	4318	4100	2700	
	Vulnerable people at risk (SFVI 4 or 5)	2383	2535	2520	2504	2383	1566	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0	0	
	Length of river restored (km)	8	0	0	Up to 1km	Up to 2km	Up to 2km	

To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Ock			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations & the capacity of the natural floodplain, application of PPS25, WLMPs**	**P3 + Removal of restrictions to flow in urban locations**	**P4 + Resilience**	**P4 + Application of Making Space and storage for the benefit of downstream policy units, BAP creation**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£0.3m	£2.5m	£1.0m	£0.5m	£0.3m	£0.25	£0.3m
	Number of properties at risk (1% AEP from MDSF)	450	540	510	480	450	400 Low levels of redevelopment in the Ock results in a limited reduction in the number of properties at risk.	450 The main economic and social benefits from attenuation is in the downstream Abingdon policy unit.
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£41k	0	£20k	£41k	£41k Plus capital costs in the order of £200k per improvement. Figures assume the five most significant restrictions to flow are alleviated.	£41k The cost of resilience measures is not known at present	£41k
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1015	1215	1148	1080	1015	900	1013
	Vulnerable people at risk (SFVI 4 or 5)	248	292	276	259	248	216	243
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	6	<6	<6	6	6	6	> 6
	Length of river restored (km)	0.3	0	0	0	0	0	0.3 Would also lead to environmental improvements where watercourses have been modified and over-deepened as part of previous land drainage schemes.

To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Cothill Fen Cothill Fen supports examples of nationally rare calcareous fen and moss-rich mire communities together with associated wetland habitats.	The site is at the headwaters of the catchment and reliant on maintaining optimum groundwater levels. No actions are planned and the policy will have no impact on the site.	The site is at the headwaters of the catchment and reliant on maintaining optimum groundwater levels. No actions are planned and the policy will have no impact on the site.	The site is at the headwaters of the catchment and reliant on maintaining optimum groundwater levels. No actions are planned and the policy will have no impact on the site.	The site is at the headwaters of the catchment and reliant on maintaining optimum groundwater levels. No actions are planned and the policy will have no impact on the site.	The site is at the headwaters of the catchment and reliant on maintaining optimum groundwater levels. No actions are planned and the policy will have no impact on the site.	The site is at the headwaters of the catchment and reliant on maintaining optimum groundwater levels. No actions are planned and the policy will have no impact on the site.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	4 water dependent SSSIs	Neutral One site (Fernham Meadows) has high groundwater levels because of its location in the Ock floodplain. Three of the sites are dependent upon groundwater levels.	Neutral (providing land drainage at Fernham Meadows is avoided) One site (Fernham Meadows) has high groundwater levels because of its location in the Ock floodplain. Three of the sites are dependent upon groundwater levels.	Neutral (providing land drainage at Fernham Meadows is avoided) One site (Fernham Meadows) has high groundwater levels because of its location in the Ock floodplain. Three of the sites are dependent upon groundwater levels.	Neutral (providing land drainage at Fernham Meadows is avoided) One site (Fernham Meadows) has high groundwater levels because of its location in the Ock floodplain. Three of the sites are dependent upon groundwater levels.	Neutral (providing land drainage at Fernham Meadows is avoided) One site (Fernham Meadows) has high groundwater levels because of its location in the Ock floodplain. Three of the sites are dependent upon groundwater levels.	Neutral One site (Fernham Meadows) has high groundwater levels because of its location in the Ock floodplain. Three of the sites are dependent upon groundwater levels.
			Three of the SSSI's within the Ock policy unit: Barrow Farm Fen, Cothill Fen and Frilford Heath and Ponds are fen / heath environments that are reliant on optimum groundwater levels. For example, Barrow Farm Fen has changed considerably since 1960 as a consequence of the general lowering of the water table, and also because of the increasing dominance of carr vegetation. Many species of plant formerly recorded from the site, such as grass of Parnassus *Parnassia palustris* and marsh helleborine *Epipactis palustris*, may survive as seed and could recur if conditions again became favourable (a raising of the groundwater water table). One site: Fernham Meadows consists of a series of hay meadows and a small area of woodland within the floodplain of the River Ock. At this site, the poor drainage properties of this soil, and the high water table associated with the site's location near the course of the River Ock, create the seasonally wet ground conditions and local variations which influence the vegetation pattern. At present this site is 87% favourable. The remainder of the site is recovering.					

Sandford to Cookham			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban areas & the capacity of the natural floodplain within and upstream of this policy unit,**	**P3 + Removal of restrictions to flow in urban locations on the tributaries eg Pangbourne, Strategic application of PPS25 (including floodplain zoning, resilience, risk**	**P4 + Resilience or local flood defences in some vulnerable locations**	**P4 or P5 + Application of Making Space for Water with a focus on attenuation in the Upper Thames policy unit, BAP creation**

					application of PPS25, Maintain weirs	**reduction at an agreed scale)**		
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	13.14	48.28	£20m	17.35	13.14	£13m to £10m	13.14
	Number of properties at risk (1% AEP from MDSF)	5158	7793	6800	6736	5158	4600 (Assumes 10% penetration of resilience)	5158 The impact of P6 within the policy unit would be small on economic indicators. This is because the volume of water is so large.
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£1160k	0	£1010m There is only a small reduction in maintenance costs under P2 because of statutory duties to maintain levels for navigation.	£1160m	£1160m Plus capital costs in the range £1m to increase the conveyance on some of the major tributaries £50k (1 FTE) for influencing and flood awareness.	£1160m The cost of resilience measures is not yet known.	£11160m Plus capital interventions to hold water on the floodplain
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	11606	17534	16345	15156	11606	10350	11606
	Vulnerable people at risk (SFVI 4 or 5)	3773	5786	5394	5001	3773	3416	3830
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	10.59	10.59	10.59	10.59	10.59	10.59	10.59 to 20 P6 in this policy unit would involve holding water on the floodplain for the benefit of habitat
	Length of river restored (km)	10	0	0	Up to 1km	Up to 2km	Up to 2km	Up to 5km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	2 water dependent SSSIs	Negative. Ceasing operations in this policy unit would increase the frequency of flooding and could result in a loss in the fluctuation in water levels	Uncertain It is not clear whether a slight increase in the frequency of flooding would have any consequences for the site	Uncertain It is not clear whether a slight increase in the frequency of flooding would have any consequences for the site	Neutral or Positive Cock Marsh is currently in favourable condition because of the variation in water levels partially related to periodic flooding.	Negative Reducing the frequency of flooding would have a negative impact at Cock Marsh SSSI.	Negative A significant increase in the duration / frequency of flooding could have negative impacts at Cock Marsh SSSI.

			that Cock Marsh SSSI is dependent upon.					
			At the Cock Marsh SSSI the whole low-lying area of the site is subject to periodic flooding and occasional drying out. This fluctuation in water levels is an important factor in maintaining the botanical richness. The site is in favourable condition. The aim is to maintain this fluctuation in water levels and periodic flooding. At Little Wittenham SSSI, the key features of the site are located out of the floodplain and cannot be altered by flood risk management activity.					

Thame			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban areas, application of PPS25**	**P3 + Removal of restrictions to flow in urban locations**	**P4 + Flood resilience**	**P3, P4 or P5 + maintaining or enhancing the capacity of the natural floodplain, BAP creation**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	0.32	1.9	1.15	0.4	0.32	0.29	
	Number of properties at risk (1% AEP from MDSF)	109	2150	1152	155	109	90	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£100k	0	£50k	£100k	£100k Plus capital costs in the range £0.1m to £1m	£100k The additional costs of resilience are not known at present.	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	245	4838	2593	349	245	203	
	Vulnerable people at risk (SFVI 4 or 5)	113	2225	1193	161	113	93	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	1	1	1	1	1	1	>1
	Length of river restored (km)	1km	1km Assumes that some of the watercourses return to a more natural state	Up to 1km	0	0	0	Up to 1km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	4 SSSIs	The SSSIs are independent from flooding policy since they are groundwater	The SSSIs are independent from flooding policy since they are groundwater dependent.	The SSSIs are independent from flooding policy since they are groundwater dependent.	The SSSIs are independent from flooding policy since they are groundwater dependent.	The SSSIs are independent from flooding policy since they are groundwater dependent.	The SSSIs are independent from flooding policy since they are groundwater dependent.

			dependent.					
			One SSSI (Spartum Fen) is a fen environment where the water supply for the fen originates in the Portland Bed aquifer and reaches the site under artesian pressure i.e. it is groundwater fed. The other three SSSI's are reservoir sites. Though water dependent sites, their condition is independent of flood risk management activity.					

Aylesbury			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, PPS25 Sequential test resulting in no Greenfield development in floodplains and Greenfield rates of run-off being achieved in new development, Aylesbury FAS maintained**	**P3 + Strategic application of PPS25 to achieve optimal layout and design of redevelopment in the river corridors through Aylesbury**	**P4 + Resilience and land swapping through the urban corridor**	**Not widely applicable in this policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	6.21	36.89	21.835	6.78	6.21	5.6	
	Number of properties at risk (1% AEP from MDSF)	2019	2581 to 5000	2530 to 5000 Reduction in development control activity could result in more properties in the floodplain because of the growth in this policy unit.	2479	2019	1800 (Assumes 10% penetration of flood resilience measures)	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£236k	0	£120k	£236k	£236k Plus £50k per year for five years to ensure appropriate adaptation of the urban environment	£236k Cost of resilience is unknown at present.	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	4543	5807	5693	5578	4543	4050	
	Vulnerable people at risk (SFVI 4 or 5)	2374	3020	2960	2901	2374	2106	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0	0	
	Length of river restored (km)	8	0	0	Up to 2km	Up to 4km	Up to 4km	

						Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor		
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Kennet			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations and the capacity of the exisitng natural floodplain, application of PPS25**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment (with a focus in Newbury and the floodplain upstream of Reading)**	**P4 +Small scale flood alleviation options**	**P5 + maintaining or enhancing the capacity of the natural floodplain, enhancing or expanding BAP habitat**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	10.65	46	29.275	12.55	10.65	6	6
	Number of properties at risk (1% AEP from MDSF)	2615	3970	3666	3363	2615	1800	1800
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£311k	0	£150k Not carrying out an annual clearance in some villages is likely to result in flooding most years, hence a large increase in damages.	£311k	£600k Would need a large increase in maintenance expenditure to offset the impacts of climate change. £100k per annum to influence land use planning and improve flood warning provision.	£311k + Capital costs in the range £4m to £8m	£311k + Capital costs in the range £4m to £8m May need additional expenditure to maintain optimal conditions at designated sites
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	5884	8933	8250	7567	5884	4050	4050
	Vulnerable people at risk (SFVI 4 or 5)	1863	2859	2640	2421	1863	1296	1296
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	7.14	<7.14	<7.14	<7.14	+ or - 7.14	+ or - 7.14	>>> 7.14
	Length of river restored (km)	7	0	0	0-1	0-1	0-1	0-2

To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	River Lambourn River Kennet Thatcham Reedbeds Kennet Valley Alderwoods	+'ve to neutral This policy could be complementary to the requirements to maintain damp conditions, water levels and natural processes. Further investigation would be needed to establish whether doing nothing would have adverse impacts.	+'ve to neutral This policy could be complementary to the requirements to maintain damp conditions, water levels and natural processes. Further investigation would be needed to establish whether doing less would have adverse impacts	-'ve to neutral This policy would not be complementary to the requirements to maintain damp conditions, water levels and natural processes. In practice this could be achieved at these sites under this policy	-'ve to neutral This policy would not be complementary to the requirements to maintain damp conditions, water levels and natural processes. In practice this could be achieved at these sites under this policy	-'ve to neutral This policy would not be complementary to the requirements to maintain damp conditions, water levels and natural processes. In practice this could be achieved at these sites under this policy	+'ve The selected policy is complementary to the management requirements of the site to maintain water levels and natural processes.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	15 water dependent SSSIs 7 of these sites have a clear relationship with flood risk management activity	Negative Intervention is required to restore rivers at three sites There would be benefits at four sites arising from the increased frequency of flooding.	Negative Intervention is required to restore rivers at three sites There would be benefits at four sites arising from the increased frequency of flooding.	Neutral or Positive River restoration at three sites would have positive impacts providing there are no measures implemented to reduce the frequency of flooding	Neutral or Positive River restoration at three sites would have positive impacts providing there are no measures implemented to reduce the frequency of flooding	Neutral or Positive River restoration at three sites would have positive impacts at 3 sites providing there are no measures implemented to reduce the frequency of flooding at 4 sites where this is a key driver	Positive To maintain winter flooding at 4 sites alongside river restoration at 3.
			There are a wide variety of SSSI's within the Kennet policy unit. **The over-riding flood risk management related requirements for sites in the Kennet policy unit is the restoration of the natural and physical features at three SSSI's that are in unfavourable condition and the continued winter flooding and maintenance of damp conditions at a number of sites that support reedbed, fen and other floodplain habitats that are in favourable or recovering condition. This statement applies to seven SSSI's in the policy unit: River Lambourn, River Kennet, Kennet and Lambourn floodplain, Chilton Foliat Meadows, Thatcham Reedbeds, Kennet Valley Alderwoods, Boxford Water Meadows.** The key characteristics are detailed below. **Sites where there is a requirement to maintain natural and physical features** At three sites (River kennet, River lambourn and Chilton Foliat Meadows there is a requirement to maintain natural and physical features. The physical features of the river or stream (its natural structure and form) should be maintained as far as possible in their natural state. This will support a natural flow regime that will help conserve the geomorphological features of interest. It will also ensure the provision of resting pools for fish, conserve the quality of the riverbed as fish spawning habitat and avoid the creation of artificial barriers to the passage of migratory fish and other animals, such as otters. Natural barriers to the movement of fish (such as waterfalls) should be left alone. Where artificial modifications have occurred - such as weirs and impoundments, embankment, straightening and dredging – the restoration of natural channel profiles and dynamics is desirable where appropriate. Any new infrastructure, such as road and rail bridges should be carefully designed to avoid the constriction of the river or blockage of its floodplain. Opportunities should be taken to create additional riparian areas where flooding is acceptable, in order to reconnect the river with its floodplain. All three sites are predominantly in unfavourable condition.						

			Sites where winter flooding is required 3 sites (Boxford Water Meadows which is in 100% favourable condition, Kennet and Lambourn Floodplain and the Chilton Foliat water meadows) are where winter flooding is an important factor in the management of floodplain habitats and management should ensure the frequency and extent of flooding is appropriate for maintaining the nature conservation interest of the site. For example, river engineering has in many cases reduced the frequency and extent of flooding. **Thatcham Reedbeds** Have a range of requirements, most notably to maintain damp conditions all year round, maintain a high water table and a regular supply of water to the site. **Sites where there is a requirement to maintain optimum water depths** 1 site (Aldermaston Gravel Pit) requires the maintenance of optimum water depths. **Maintain Drainage** 6 sites require regular and careful maintenance of surface drainage including ditches and drains as these can be necessary to prevent adverse changes in the plant species composition of the sward. At these sites the deepening of surface drainage should be avoided. For example the use of mole, tile, tunnel or other artificial drains should be avoided. These sites are all hay meadows or neutral pasture 3 of these sites are in 100% favourable condition, 3 are in unfavourable condition but recovering. 3 other sites in the policy unit are groundwater or water quality dependent.

Reading			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, Application of PPS25, Safeguard the capacity of the upstream floodplain, Safeguard land that may be needed for future flood risk management purposes**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment**	**P4 + Flood resilience or upstream flood storage / flood alleviation channels**	**Cannot be implemented in Reading**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	13.14	31.04	25.225	19.41	13.14	£8m	
	Number of properties at risk (1% AEP from MDSF)	4894	7351	6310	5269	4894	3000 to 4500	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£110k	0	£50k	£110k	£110k	£110k Plus capital costs. For alleviation schemes in Reading they are likely to be in the range £10m to £20m. For upstream storage the costs are unknown.	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	11012	16540	14198	11855	11012	6750 to 10125	

	Vulnerable people at risk (SFVI 4 or 5)	2102	3143	2698	2252	2102	1283 to 1924	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.1	<0.1	<0.1	0.1	0.1	0.1	
	Length of river restored (km)	2.4	0	0	0	Up to 1km	Up to 1km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Loddon			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, application of PPS25**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment in the Lower Loddon, Telemetry and flood warning improvements, Flood resilience**	**P4 + Possible flood defences in the Lower Loddon**	**P5 + maintaining or enhancing the capacity of the natural floodplain, BAP creation**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	2.12	9.97	6.15	2.33	2.12	£1m	£0.9m
	Number of properties at risk (1% AEP from MDSF)	449	2106	1341	576	449	200	180
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£299k	0	£150k	£299k	£299k Plus £50k for five years for influencing and flood awareness	£299k Plus capital costs in the range of £2m to £5m	£299k Plus capital costs in the range of £2m to £5m
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1010	4739	3017	1296	1010	450	405
	Vulnerable people at risk (SFVI 4 or 5)	149	711	453	194	149	68	61
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	4.16	>4.16	4.16	4.16	4.16	4.16	>4.16
	Length of river restored (km)	5	5	0	Up to 1km	Up to 1km	Up to 1km	Up to 2km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Thames Basin Heaths	The water requirements at these sites are very site specific. The impact of do nothing is	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral.	The water requirements at these sites are very site specific. Overall the policy is likely to be -'ve to neutral. There are many site dependent factors that are	The water requirements at these sites are very site specific. Overall the policy is likely to be -'ve to neutral. There are many site	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral.

			highly uncertain. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	5 water dependent SSSIs 3 of the sites (Stanford End Mill and the River Loddon, Greywell Fen and Mapledurwell Fen) have a direct relationship with FRM activity	Neutral, but potentially Negative at Stanford End Mill. This is because one of the key species at the site survives best in water which is well aerated and low in ammonium nitrogen, the plant often occurring downstream of weirs and sluices which require some form of maintenance	Neutral Providing key structures are maintained and watercourse maintenance does not reduce the frequency of winter flooding	Neutral Providing key structures are maintained and watercourse maintenance does not reduce the frequency of winter flooding	Neutral Providing key structures are maintained and watercourse maintenance does not reduce the frequency of winter flooding	Neutral Providing key structures are maintained and watercourse maintenance does not reduce the frequency of winter flooding	Neutral to Positive (at Mapledurwell fen) where winter flooding is required.
			Stanford End Mill and River Loddon: Maintain physical features. The site comprises Stanford End Mill meadows, a series of traditionally-managed seasonally waterlogged hay meadows, and a 4 km stretch of the River Loddon. The valley is situated on Tertiary deposits of Valley Gravel and River Alluvium overlying London Clay. The site is of interest particularly for nationally important populations of two rare plants: the fritillary *Fritillary meleagris*, a native bulb of unimproved damp meadows now mainly confined to scattered localities in southern Britain, and the Loddon pondweed *Potamogeton nodosus*, a very rare aquatic species for which this length of the River Loddon is the national stronghold. The site is in favourable condition. **Greywell Fen** is a calcareous valley mire extending for about 2km along the headwaters of the River Whitewater. There are two distinct sections: Upstream, the fen is primarily unmanaged agriculturally and is dominated by alder carr. The lower section of the site is wet fen meadow, grazed by cattle. Parts of this lower section have been agriculturally improved in recent years and their flora has been much reduced in diversity overall.					

			Mapledurwell Fen: Winter flooding is an important factor in the management of floodplain habitats and management should ensure the frequency and extent of flooding is appropriate for maintaining the nature conservation interest of the site. **Fleet Pond and Odiham Common**: Avoid abstraction that can impact on the supply of water to ponds.

Basingstoke			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, PPS25 Sequential test resulting in no Greenfield development in floodplains and Greenfield rates of run-off being achieved in new development**	**P3 + Strategic application of PPS25 to achieve optimal layout and design of redevelopment in the river corridors through Basingstoke, Urban Drainage Planning and incorporating SUDS as part of redevelopment**	**P4 + Defences**	**Not widely applicable in this policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£0.2m	£1m	£0.6m	£0.26m	£0.2m	£0.1m	
	Number of properties at risk (1% AEP from MDSF)	828	1080	920 Reduction in development control activity could result in more properties in the floodplain because of the growth in this policy unit.	840	828	600	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£11k	0	£5k	£11k	£11k Plus £50k per year for five years to ensure appropriate adaptation of the urban environment	£11k Capital costs in Basingstoke are not known	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1863	2430	2070	1890	1863	1350	
	Vulnerable people at risk (SFVI 4 or 5)	392	510	435	397	1863	284	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.02	0.02	0.02	0.02	>0.02	>0.02	
	Length of river restored (km)	0.5	0	0	0	Up to 0.5km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	0	

To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Upper and Middle Blackwater			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, Maintain the capacity of the existing river corridor, PPS25 Sequential test resulting in no greenfield development in floodplains and greenfield rates of run-off being achieved in new development**	**P3 + Strategic application of PPS25 to achieve optimal layout and design of redevelopment in the river corridors through eg in Blackwater, Urban Drainage Planning, WLMPs**	**P4 + Defences**	**P3, P4 or P5 + Flood storage on the Blackwater tributaires and restoration of floodplain eg for BAP habitat**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	1.2	4.0	2.0	1.56	1.2	£1.2m to £1.0m	
	Number of properties at risk (1% AEP from MDSF)	1372	4000	1800 to 5000 Reduction in development control activity could result in more properties in the floodplain because of the growth in this policy unit.	1630	1372	1000 to 1370 Multiple defences would be needed on the tributaries of the Blackwater so the impacts would be relatively small at a policy unit level	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£243k	0	£120k	£243k	£243k Plus £50k per year for five years to ensure appropriate adaptation of the urban environment	£243k Capital costs are likely to be in the range of £2m to £10m	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	3087	9000	4050 to 11250	3668	3087	2250 to 3083	
	Vulnerable people at risk (SFVI 4 or 5)	520	1530	689 to 1913	624	520	383 to 524	
To enhance and expand floodplain BAP habitat and	**Area of BAP habitat** (km^2)	0.81	>0.81	0.81	0.81	>0.81	>0.81	>0.81

restore urban watercourses	**Length of river restored** (km)	25	5	0	Up to 5km	Up to 10km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	Up to 10km	Up to 10km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Thames Basin Heaths	The water requirements at these sites are very site specific. The impact of do nothing is highly uncertain. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be -'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be -'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	2 water dependent SSSIs	Negative Some maintenance is required at the site	Negative or Uncertain The condition of the sites are most closely related to maintaining constant high water levels and this is partially dependent upon WLMP actions	Neutral or Uncertain The condition of the sites are most closely related to maintaining constant high water levels and this is partially dependent upon WLMP actions	Uncertain to positive The condition of the sites are most closely related to maintaining constant high water levels and this is partially dependent upon WLMP actions. Under this policy it is assumed that these actions can be implemented	Uncertain to positive The condition of the sites are most closely related to maintaining constant high water levels and this is partially dependent upon WLMP actions. Under this policy it is assumed that these actions can be implemented	Uncertain to positive The condition of the sites are most closely related to maintaining constant high water levels and this is partially dependent upon WLMP actions. Under this policy it is assumed that these actions can be implemented
			Sandhurst to Owlsmoor bogs and Heaths area valley mire where drainage schemes should not intercept the sources of ground and surface water to the valley mire. The bed of the watercourse should not be lowered, nor should its water level be artificially raised, other than as part of a well thought-out conservation scheme. The site is in unfavourable condition, but recovering. Blackwater Valley is a natural hay meadow. In the damper pastures, regular and careful maintenance of surface drainage including ditches and					

			drains can be essential to prevent adverse changes in the plant species composition of the sward. Deepening of surface drainage should be avoided.

Addlestone Bourne, Emm Brook and Cut			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, application of PPS25**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment in river corridors, Surface Water Management Planning, Removal of restrictions to flow in urban locations eg Bracknell**	**P4 + Further removal of obstructions to flow, Resilience eg in Wokingham**	**P4 + Flood storage on the Emm Brook and Addlestone Bourne and SuDs**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£0.65m	£2.2m	£1.5m There is a large increase in the properties at risk under this policy because of the risk of blockages in this policy unit	0.83	0.65	< £0.65m	< £0.65m
	Number of properties at risk (1% AEP from MDSF)	1423	2288	2100	1610	1423	< 1423	<1423
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£252k	0	£125k	£252k	< £252k With a transfer of resource to influence the character of redevelopment to open up river corridors and increase the resilience of the urban environment	£252k	£252k With a transfer of resource to influence the character of redevelopment to open up river corridors and increase the resilience of the urban environment Capital costs of storage are not known
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	3202	5148	4725	3623	3202	<3202	<3202
	Vulnerable people at risk (SFVI 4 or 5)	963	1544	1418	1087	963	<963	<963
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0	0	
	Length of river restored (km)	10	0	0	Up to 2km	Up to 5km Assumes that redevelopment leads to a different urban layout that provides the opportunity to	Up to 5km Assumes that redevelopment leads to a different urban layout that provides the	Up to 5km Assumes that redevelopment leads to a different urban layout that provides

						restore parts of the river corridor	opportunity to restore parts of the river corridor	the opportunity to restore parts of the river corridor
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Thames Basin Heaths	The water requirements at these sites are very site specific. The impact of do nothing is highly uncertain. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be –'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be –'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	2 water dependent SSSIs	The water requirements at these sites are very site specific. The impact of do nothing is highly uncertain. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.

			and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	specific.				
			The two SSSI's in this policy unit are: **Colony Bog and Bagshot Heaths**: contain a variety of dry and wetland heath habitats. In the wetland areas the aim of management is to re-start the peat-forming process, ideally without going through the fen phases that in most cases preceded acid peat formation in the first instance. Management must restore a high and stable water table in the peat, not falling more than about 10 cm below the surface over the course of the year. In damaged bogs this is done by blocking ditches and repairing baulks left by peat extraction or by creating new ones. **Broadmoor to Bagshot Woods and Heaths**: Water levels within areas of wet heath should be maintained to avoid adverse changes to the characteristic plant composition of the habitat. In some instances it may be appropriate to restore natural drainage where this is possible.					

Rural Wey			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, application of PPS25**	**P3 + Removal of restrictions to flow in urban locations, BAP creation, strategic application of PPS25 to achieve optimal location, layout and design of redevelopment**	**P4 + Resilience (for example in Godalming)**	**P4 + maintaining or enhancing the capacity of the natural floodplain, restoring river channels in urban areas (eg Cranleigh)**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	3.81	£11.12m	£5.0m	4.03	3.81	£2.0m	£3.6m In the Wey catchment attenuation has a small impact
	Number of properties at risk (1% AEP from MDSF)	597	647	647	647	597	497	560
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£749k	0	£350k to £700k Including a transfer of resource and activity to focus on urban locations	£749k	£500k to £750k	£500k to £750k The cost of any potential resilience measures is not known	£500k to £750k
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1343	1456	1456	1456	1343	1118	1260
	Vulnerable people at risk (SFVI 4 or 5)	126	131	131	131	126	101	113
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	2.91	<2.91	<2.91	2.91	>2.91	>2.91	>2.91
	Length of river restored (km)	5	0	0	0	Up to 2km	Up to 2km	Up to 2km

To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Thursley and Ockley Bogs (SPA) Thames Basin Heaths (SPA) Shortheath Common (SAC) Thursley, Ash, Pirbright and Chobham (SAC) Wealden Heaths Phase II (SPA)	The water requirements at these sites are very site specific. The impact of do nothing is highly uncertain. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be -'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be -'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	3 water dependent SSSIs	Neutral to Positive: Allows winter flooding, left unmodified	Neutral to Positive: Allows winter flooding, left unmodified	Neutral	Neutral	Neutral	Neutral to Positive: Allows winter flooding, left unmodified
			Thursley, Hankley & Frensham Commons: support a very wide range of habitat including some that are water dependent. This site includes peatland habitats that are typically found in waterlogged conditions where the wetland vegetation builds up organic deposits over the underlying mineral substrate. At this site peatlands have developed in three ways: along river valleys, over expanses of shallow water or on relatively flat ground where drainage is very heavily impeded. The bog communities associated with these modes of development are diverse due to local variation in a number of factors: these include the range of nutrient status of soil and water and the varying degree of inundation of, and the different speeds of water movement through the peat. Part of the site is in favourable condition. **Charterhouse to Eashing:** Is in the flood plain of the River Wey contains a series of finely graded wetland communities ranging from damp grassland to fen and alder swamp. Winter flooding is an important factor in the management of floodplain habitats and management should ensure the frequency and extent of flooding is appropriate for maintaining the nature conservation interest of the site. **Woolmer Forest:** Woolmer Forest SSSI contains the largest and most diverse area of lowland heathland habitats in Hampshire (outside the New Forest). Where drainage is at its most impeded, the wet heath merges into a series of complex valley mire systems. These show classic patterns of zonation related to the hydrology and management history of the mire. Small acidic streams cross the SSSI, most notably Holly Water and its tributaries. These are largely unmodified by drainage works and follow a natural meandering course. 77% of the site is recovering. In summary;					

			- The sites require some winter flooding - The sites need drainage and watercourses to be left unmodified and natural - The management is localised and site specific.

Guildford			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, Application of PPS25, Safeguard the capacity of the upstream floodplain**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment (eg though Guildford town centre, Specific flood warning improvements**	**P4 + Resilience to residential properties**	**Cannot be implemented in Guildford**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	16.41	9.95	5.9	1.7	1.6	£0.5m	
	Number of properties at risk (1% AEP from MDSF)	826	988	980 Reduction in development control activity could result in more properties in the floodplain because of the growth in this policy unit.	972	826	200	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£47k	0	£20k	£47k	£47k Plus 1 FTE to facilitate and influence adaptation of the urban environment (£50k per year for at least five years)	£47k Plus 1 FTE to facilitate and influence adaptation of the urban environment (£50k per year for at least five years) Plus costs of resilience measures which are not known at present.	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1859	2223	2205	2187	1859	450	
	Vulnerable people at risk (SFVI 4 or 5)	630	756	750	744	630	153	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.08	<0.08	<0.08	0.08	0.08	0.08	
	Length of river restored (km)	14	0	0	Up to 1km	Up to 5km Assumes that	Up to 5km	

						redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor		
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Hoe Stream			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in the urban areas Maintain the capacity of the existing natural floodplain Application of PPS25**	**P3 + Removal of restrictions to flow in urban locations, Resilience**	**P4 + Flood defences and river restoration**	**Not applicable in this policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£0.35m	£4.9m	£1.0m to £0.5m	£0.5m to £0.8m	£0.35m	£0.05m	
	Number of properties at risk (1% AEP from MDSF)	260	490	420	330	260	50 to 100	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£47k	0	£20k	£47k	£47 k Plus capital costs in the range £0.1m to 1.0m	£47 k Plus capital costs in the range £2m to 4m	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	585	1103	945	743	585	113 to 225	
	Vulnerable people at risk (SFVI 4 or 5)	99	188	161	126	99	19 to 38	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0	0	
	Length of river restored (km)	1	0	0	0	0	1km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Thames Basin Heaths	The water requirements at these sites are very site specific. The impact of do nothing is highly uncertain.	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to	The water requirements at these sites are very site specific. Overall the policy is likely to be -'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements	The water requirements at these sites are very site specific. Overall the policy is likely to be -'ve to neutral. There are many site dependent factors that are relevant to these sites. Overall, the main	The water requirements at these sites are very site specific. Overall the policy is likely to be +'ve to neutral. There are many site dependent factors that are relevant to these

			There are many site dependent factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	factors that are relevant to these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	these sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.	sites. Overall, the main hydrological requirements are to maintain water levels and restore natural drainage and avoid the deepening of drainage channels. This is highly site specific.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	2 water dependent SSSIs	The water requirements at these sites are very site specific. Groundwater levels in periods of drought are the primary hydrological driver. The policy impact is uncertain.	The water requirements at these sites are very site specific. Groundwater levels in periods of drought are the primary hydrological driver. The policy impact is uncertain.	The water requirements at these sites are very site specific. Groundwater levels in periods of drought are the primary hydrological driver. The policy impact is uncertain.	The water requirements at these sites are very site specific. Groundwater levels in periods of drought are the primary hydrological driver. The policy impact is uncertain.	The water requirements at these sites are very site specific. Groundwater levels in periods of drought are the primary hydrological driver. The policy impact is uncertain.	The water requirements at these sites are very site specific. Groundwater levels in periods of drought are the primary hydrological driver. The policy impact is uncertain.
			Whitmoor Common: The streams contain pond water-crowfoot *Ranunculus peltatus* and contribute to the wetland communities at times of flooding. Water levels within areas of wet heath should be maintained to avoid adverse changes to the characteristic plant composition of the habitat. **Ash to Brookwood Heaths**: Where the water table is close to the surface the soil is waterlogged and peat has developed, but on the higher ground the free-draining sand and gravel give rise to a very dry acidic sandy soil. Drainage schemes should be designed not to intercept the sources of ground and surface water to the valley mire. The bed of the watercourse should not be lowered, nor should its water level be artificially raised, other than as part of a well thought-out conservation scheme. This will ensure the various vegetation components of the valley mire are maintained in their ideal proportions, and that 'head-ward' erosion is not triggered, in which increased flow gradually erodes the peat and silt on which the valley mire has developed.					

Byfleet and Weybridge			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, Application of PPS25, Safeguard the capacity of the upstream floodplain, Safeguard land that may be needed for future flood risk management purposes**	**P3 + Telemetry and flood awareness**	**P4 + Flood resilience and / or flood alleviation options**	**Cannot be implemented in Byfleet and Weybridge**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	4.64	23.77	14.475	5.18	4.64	£1m to £2m	
	Number of properties at risk (1% AEP from MDSF)	842	4389	2717	1045	842	400 Capital options are technically feasible to protect approx. half the properties at risk in this policy unit.	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£18k	0	£9k	£18k	£50k Plus additional flood warning expenditure in the range of £0.2m to £1m	£50k Plus capital costs in the range £2m to £10m	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1895	9875	6113	2351	1895	900	
	Vulnerable people at risk (SFVI 4 or 5)	245	1284	795	306	245	117	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.08	<0.08	<0.08	0.08	0.08	0.08	
	Length of river restored (km)	1.5	0	0	0	Up to 0.5km	Up to 0.5km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Windsor and Maidenhead			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations, scrutiny of high risk planning applications**	**P2 + Maintain the MWEFAS scheme, application of PPS25, maintain the capacity of the natural floodplain**	**P3 + additional flood defences**	**P4 + Flood resilience**	**Cannot be applied in this policy unit.**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	7.48	16.91	14.93	12.95	7.48	6.5	
	Number of properties at risk (1% AEP from MDSF)	8010	14605	13218	11831	8010	7200 (Assumes 10% penetration of flood resilience)	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£525k	0	£400k There is only a small reduction in maintenance costs under P2 because of statutory duties to maintain levels for navigation.	£525k	£525k Plus major capital investment	£525k The cost of resilience options is not known at present.	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	18023	32861	29741	26620	18023	16200	
	Vulnerable people at risk (SFVI 4 or 5)	2862	5258	4759	4259	2862	2592	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.25	0.25	0.25	0.25	0.25	0.25	
	Length of river restored (km)	41	0	0	Up to 5km	Up to 10km	Up to 10km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Lower Thames			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, Application of PPS25, Safeguard the capacity of the upstream floodplain, Safeguard land that may be needed for future flood risk management purposes**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment, Flood Alleviation scheme for Chertsey**	**P4 + Flood resilience and /or alleviation channels, localised protection**	**Not viable in the Lower Thames**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	76.83	257.61	180.81	104.01	76.83	£30m	
	Number of properties at risk (1% AEP from MDSF)	26868	44665	38445	32225	26868	20600	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£406k	0	£300k There is only a small reduction in maintenance costs under P2 because of statutory duties to maintain levels for navigation.	£406k	£406k Plus £100k for influencing	£406k per year Plus capital costs in excess of £150m for a large scheme to tens of millions for local protection	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	60453	100496	86501	72506	60453	46350	
	Vulnerable people at risk (SFVI 4 or 5)	8723	14069	12110	10151	8723	6489	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	1.89	<1.89	<1.89	1.89	+ or - 1.89	+ or - 1.89 The impact of a scheme on the area of BAP habitat is entirely dependent upon the character of the scheme. Our aim would be to increase the quality and area of habitat	
	Length of river restored (km)	70	0	0	Up to 5km	Up to 10km	Up to 10km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	South West London waterbodies	+'ve	+'ve or –'ve Dependent on implementation as there are many site specific uncertainties	+'ve or –'ve Dependent on implementation as there are many site specific uncertainties	+'ve or –'ve Dependent on implementation as there are many site specific uncertainties	+'ve or –'ve Dependent on implementation as there are many site specific uncertainties	+'ve or –'ve Dependent on implementation as there are many site specific uncertainties
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	4 water dependent SSSIs	Negative Stopping the operation of	Neutral Providing operations continue	Neutral Providing operations continue to maintain	Neutral Providing operations continue to maintain water	Potentially negative Periodic inundation is a feature of these sites.	Potentially negative Periodic inundation is a feature of these

			structures in the policy unit could have an impact on groundwater levels.	to maintain water levels (recognising the uncertain relationship between the operation of structures and groundwater levels)	water levels (recognising the uncertain relationship between the operation of structures and groundwater levels)	levels (recognising the uncertain relationship between the operation of structures and groundwater levels)	Less frequent inundation would have uncertain impacts.	sites. More regular inundation would have uncertain impacts.
			All of the sites require optimum water levels to be maintained and for interventions that could lead to increased drainage to be avoided. Staines Moor: The site chiefly consists of Staines Moor, a semi-natural stretch of the River Colne which flows through it, and three adjacent reservoirs. The alluvial meadows have not been subject to intensive agricultural use in recent years; this factor, combined with the large size of the meadows and the richness diversity of their flora, is responsible for the importance of these grasslands to wildlife. Depressions with a permanently high water table occur throughout the meadows and support a fen-type flora with reed sweet-grass. Dumsey Meadow is an unimproved, cattle and pony-grazed riverside pasture situated on the flood-plain of the River Thames close to Chertsey Bridge. Unimproved neutral grasslands are now very rare in SE England, and almost all those in the Thames Valley have been lost to agricultural improvement, gravel extraction, urban development or conversion to formal recreation areas. This site is the only remaining grazed unimproved Thames-side meadow in Surrey. Thorpe Hay Meadow is a small, five-sided meadow lying on the alluvial gravels of the Thames Flood Plain, surrounded by ditches and high hedges. Much of the surrounding land has been used for gravel extraction. The site is thought to be the last remaining example of a Thames valley hay meadow in Surrey. It contains a range of lime-loving (calcicole) plants which are characteristic of this type of meadow. Langham Pond and its surrounding alluvial meadows lie on the Thames flood plain and represent a habitat of a type and quality unknown elsewhere in Southern England. The combination of alluvial soils and the calcareous influence of the chalk parent rock has led to the development of rich aquatic, marginal and meadow floras. The pond supports several nationally scarce invertebrates.Woodland on adjacent higher ground above the flood plain lies on London Clay and supports a rich community of breeding birds. The pond is the remnant of an old ox-bow lake, formed when a meander of the River Thames was cut off and subsequently by-passed by the river.					

Lower Mole			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain the Lower Mole defences, application of PPS25, flood awareness and emergency response**	**P3 + local flood resilience**	**P4 + widespread Flood resilience**	**Cannot be applied in this policy unit.**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	0.58	24.35 Huge increase in damages as the existing defences deteriorate	12	1.01	0.58	0.58	
	Number of properties at risk (1% AEP from MDSF)	467	8956	4920	887	467	467	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£254k	0	£120k	£254k	£254k	£254k	

Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1051	20151	11073	1996	1051	1051	
	Vulnerable people at risk (SFVI 4 or 5)	0	0	0	0	0	0	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0	0	
	Length of river restored (km)	15	15 Large increase in natural channel as the existing defences deteriorate.	5	0	0	0	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Middle Mole			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, application of PPS25**	**P3 + Strategic application of PPS25 to ensure the integrity of river corridors and risk reduction through the cycle of redevelopment**	**P4 + Defences at key locations**	**It would be very difficult to implement P6 in the Middle Mole (it is a narrow floodplain in the middle of a river system)**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£1.2m	£2.8m	£2.1	£1.3m	£1.2m	£1.0m to £0.8m	
	Number of properties at risk (1% AEP from MDSF)	705	2370	1400	820	705	500 to 600 Although there are clusters of properties at risk, most are quite dispersed.	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£162k	0	£80k	£162k	> £ 162k	£162k Capital costs are unknown for improvement options. They are likely to be over £2m per scheme because the towns are spread out along the rivers and there are often pinch points e.g. at bridges	

Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1586	5333	3150	1845	1586	1125 to 1350	
	Vulnerable people at risk (SFVI 4 or 5)	176	587	347	203	176	124 to 149	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.33	0.33	0.33	> 0.33	>0.33	>0.33	>0.33
	Length of river restored (km)	2	0	0	Up to 0.5km	Up to 1km	Up to 1km	Up to 1km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Upper Mole			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, PPS25 Sequential test resulting in no greenfield development in floodplains and greenfield rates of run-off being achieved in new development**	**P3 + Strategic application of PPS25 to achieve optimal layout and design of redevelopment in the river corridors in the Upper Mole, Urban Drainage Planning, Removal of restrictions to flow**	**P4 + Widespread adoption of resilience**	**P4 + flood storage**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£1.7m	£5.0m to £6.0m	£3.0m to £6.0m	£1.9m	£1.7m	£1.5m	£1.5m to £1.0m Along with reduction in flood risk to Gatwick Airport
	Number of properties at risk (1% AEP from MDSF)	2756	5140	2800 to 5000 Reduction in development control activity could result in more properties in the floodplain because of the growth in this policy unit.	2800	2756	2500 (Assumes 10% penetration of flood resilience)	1500 to 2500
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£246k	0	£120k	£246k	£246k Plus £50k per year for five years to ensure appropriate adaptation of the urban environment	£246k Plus £50k per year for five years to ensure appropriate adaptation of the urban	£246k Plus £50k per year for five years to ensure appropriate adaptation of the urban

							environment The costs of resilience are unknown at present.	environment Plus capital costs between £2m and £8m
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	6201	11565	6300 to 11250	6300	6201	5625	3375 to 5625
	Vulnerable people at risk (SFVI 4 or 5)	1472	2776	1512 to 2700	1512	1472	1350	810 to 1350
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.25	<0.25	<0.25	0.25	>0.25	>0.25	>0.25
	Length of river restored (km)	5	0	0	Up to 1km	Up to 2km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	Up to 2km	Up to 2km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Colne tributaries and Wye			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, application of PPS25, More widespread flood awareness and effective action, Surface Water Management Planning e.g. Hemel Hempstead, High Wycombe, Removal of restrictions to flow in urban locations**	**P3 + Increased maintenance**	**P4 + Flood resilience**	**Not widely applicable in this policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£2.0m	£4m to £10m There is a large increase in damages because there	£3m to £5m	£2.9m	£2.0m	< £2m	

			are so many culverts in this policy unit.					
	Number of properties at risk (1% AEP from MDSF)	2316	3860	3000 to 3860	2500	2310	<2310 It is not certain how effective flood resilience would be in such a fast responding catchment	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£615k	0	£300k	< £615k Transfer of resources to influencing activity and the removal of restrictions to flow	Large increase on £615k (perhaps to £1.0m)	£615k Plus costs of resilience which are not certain at present	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	5211	8685	6750	5625	5211	<5211	
	Vulnerable people at risk (SFVI 4 or 5)	1958	3300	2565	2138	1958	<1958	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.9	0.9	0.9	0.9 to 2.0 May be a small increase in BAP habitat as maintenance is more explicitly focused in urban areas	0.9 to 2.0 May be a small increase in BAP habitat as maintenance is more explicitly focused in urban areas	0.9 to 2.0 May be a small increase in BAP habitat as maintenance is more explicitly focused in urban areas	
	Length of river restored (km)	17	Up to 5km	0	Up to 5km	0	Up to 5km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	5 water dependent SSSIs	Negative Stopping the operation of structures in the policy unit could have an impact on groundwater levels.	Neutral Providing operations continue to maintain water levels (recognising the uncertain relationship between the operation of structures and groundwater levels)	Neutral Providing operations continue to maintain water levels (recognising the uncertain relationship between the operation of structures and groundwater levels)	Neutral Providing operations continue to maintain water levels (recognising the uncertain relationship between the operation of structures and groundwater levels)	Potentially negative Periodic inundation is a feature of these sites. Less frequent inundation would have uncertain impacts.	Potentially negative Periodic inundation is a feature of these sites. More regular inundation would have uncertain impacts.
			Frogmore Meadows comprise two alluvial meadows surrounded by mature hedgerows beside the River Chess. Marshy areas and tall fen communities at the river's edge add diversity to the plant communities. **Sarratt Bottom** is an area of alluvial meadow beside the River Chess. The site is an example of damp, species rich, unimproved neutral grassland, traditionally managed for grazing and characteristic of lowland Britain. Agricultural change has severely reduced the extent of this habitat nationally, including Hertfordshire where it is very scarce. The rich plant communities show a transition from damp grassland to marsh and swamp; the latter bordering a river overflow channel which traverses part of the site and provides an important aquatic habitat. **Croxley Common Moor** is an extensive area of grass heath on freely draining sandy soils of the Colne Gravels adjacent to the River Gade. Towards the western end of the site drainage becomes poor and the grassland grades into marshy areas with tall fen vegetation.						

			Kingcup Meadows and Oldhouse Wood constitutes an intimate mosaic of habitats adjacent to the River Alderbourne, which includes woodland, unimproved pastures and semi and unimproved meadowland. The fields are comprised of dry grassland, wet grassland and areas of fen and swampy vegetation. All of the soils found along this section of the Alderbourne Valley are seasonally waterlogged or affected by ground water for much of the year. **Old Rectory Meadows** are sited on either side of the River Misbourne on alluvium. It contains a range of grassland types, notably base-rich and poor marsh, wet alluvial meadows and water meadows with grazed wet and damp meadows, as well as alder carr woodland.

Colne			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations and the capacity of the natural floodplain, application of PPS25, Telemetry and flood warning improvements**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment in river corridors eg Watford,**	**P4 + Flood resilience**	**The Colne has a very wide and flat floodplain. Attenuation options would be extremely difficult to implement and are unlikely to be cost effective. Therefore P6 is not a viable policy in this policy unit.**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	52.72	266.46	161.88	57.3 (Modelling may have over-estimated these damages)	52.72 (Modelling may have over-estimated these damages)	Cannot be certain on the viability of resilience in the Colne because of ground conditions and the potential duration of flooding	
	Number of properties at risk (1% AEP from MDSF)	6891	7723	7723	7723	6891	Cannot be certain on the viability of resilience in the Colne because of ground conditions and the potential duration of flooding	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£1099k	0	£500k	£1099k	£1099k Plus £100k per year for five years to ensure appropriate adaptation of the urban environment	£1099k The costs of resilience are unknown at present	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	15505	16137	16757	17377	15505		
	Vulnerable people at risk (SFVI 4 or 5)	3607	3712	3854	3997	3607		
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	2.21	>2.21	2.21	2.21 May be a small increase in BAP habitat as maintenance is more explicitly focused in urban areas	>2.21 May be a small increase in BAP habitat as maintenance is more explicitly focused in urban areas	>2.21 May be a small increase in BAP habitat as maintenance is more explicitly focused in urban areas	

	Length of river restored (km)	8	Up to 5m Assumes that some of the watercourses return to a more natural state	0	Up to 2km	Up to 4km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	Up to 4km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	3 water dependent SSSIs	Negative Fray's Farm requires certain parts of the site to not be flooded.	Uncertain Winter flooding is an important factor in the condition of two sites. However, it is not known whether increased winter flooding will be positive or negative	Uncertain Winter flooding is an important factor in the condition of two sites. However, it is not known whether increased winter flooding will be positive or negative	Neutral	Negative Fray's Farm meadows and Denham Lock Wood rely on partial winter flooding.	Neutral or Positive on two sites, potentially Negative on one site Winter flooding is an important factor in the condition of two sites. Fray's Farm requires part of the site to remain dry.
			Mid Colne Valley has a wide variety of habitats (associated with gravel extraction). However, the relatively unimproved stretch of the River Colne adds further diversity top the range of wetland habitats. **Fray's Farm Meadows** are one of the last remaining examples of relatively unimproved wet alluvial grassland in Greater London and the Colne Valley. With the loss of washland areas throughout London the site becomes increasingly valuable as a relict habitat. Partial winter flooding is important in maintaining suitable habitat conditions for wintering birds. A mosaic of winter flooded grassland and permanently un-flooded grassland is desirable, with both temporary and permanent pools present. The maintenance of a mosaic of shallow surface pools and un-flooded areas during the winter will provide roosting and feeding habitat for wintering wildfowl and waders. From April onwards, the area of standing surface water should be reduced to increase the area available for nesting waders and also by concentrating aquatic invertebrates in small pools to provide suitable feeding areas for their young. Some shallow areas of flooding should be maintained until late June to provide patches of bare muddy ground on which the birds and their young can feed as raised sward height makes feeding on the drier areas more difficult. **Denham Lock Wood** is a diverse area of open mire and wet woodland which shows a zonation of wetland habitats occurring rarely in Greater London. The woodland herb flora is particularly varied and reflects subtle differences in topography and drainage. The site occupies a low-lying and poorly drained area on the floor of the Colne Valley. Generally the water table is at or near the soil surface through most of the year and in parts there is periodic flooding as a result of local variations in topography. These conditions have favoured the establishment of distinctive ecological transitions from open flood plain mire, through willow carr to wet valley alderwood. The site is in favourable condition. Winter flooding is an important factor in the management of floodplain habitats and management should ensure the frequency and extent of flooding is appropriate for maintaining the nature conservation interest of the site.					

Pinn			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance in the urban areas Maintain the capacity of the existing natural floodplain Application of PPS25 Maintain existing flood bunds**	**P3 + Strategic application of PPS25: River corridor redevelopment to reduce flood risk (focus on layout and design) Existing open space safeguarded Urban Drainage and widespread adoption of SuDs eg in Pinner**	**P4 + Flood resilience**	**P4 or P5 + Optimum balance between conveyance and attenuation within the policy unit – linked to the existing land use pattern Multiple use of open space eg BAP creation**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£2.5m	2.6	1.9	1.5	1.0	0.9	< £1.0m
	Number of properties at risk (1% AEP from MDSF)	1410	2630	2000	1700	1410	<2630	< 2630
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£223k	0	£110k	£223k	£223k Plus £50k per year for five years to ensure appropriate adaptation of the urban environment	£223k The costs of resilience are unknown at present.	£223k The capital costs have not been assessed. This is because the intention would be to assess the merits of implementation rather than replacing the existing defences when they need to be renewed.
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	3186	5918	4500	3825	3186	<5918	<5918
	Vulnerable people at risk (SFVI 4 or 5)	716	1361	1035	880	716	<1361	<1361
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	1.21	1.21	1.21	1.21	1.21	1.21	>1.21
	Length of river restored (km)	2.5	0	0	Up to 0.5km	Up to 1km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	Up to 1km	Up to 1km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Luton			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, PPS25 Sequential test resulting in no Greenfield development in floodplains and Greenfield rates of run-off being achieved in new development**	**P3 + Strategic application of PPS25 to achieve optimal layout and design of redevelopment in the river corridors through Luton, Urban Drainage Planning and incorporating SUDS as part of redevelopment, small scale flood storage**	**P4 + Defences and widespread adoption of resilience approaches**	**Not widely applicable in this policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	0.12	£2.7m	£2m	0.24	0.12	0.1	
	Number of properties at risk (1% AEP from MDSF)	760	2706	1940	1174	760	<760	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£176k	0	£90k	£176k	£176k Plus £50k per year for five years to ensure appropriate adaptation of the urban environment Capital costs in the range £1m to £5m	£176k Plus £50k per year for five years to ensure appropriate adaptation of the urban environment Plus capital costs in excess of £5m	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1710	6089	4365	2642	1710	<1710	
	Vulnerable people at risk (SFVI 4 or 5)	1249	4445	3186	1929	1249	<1249	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0	0	
	Length of river restored (km)	4.5	0	0	Up to 1km	Up to 4.5km There are opportunities to restore rivers as the town centre is redeveloped over the coming decades	Up to 4.5km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Upper Lee			Impact of Policy options to 2050 to 2100					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, application of PPS25, Enforcement and community action, Removal of restrictions to flow in urban locations, WLMPs**	**P3 + Management of Surface water drainage e.g. Stevenage and increased maintenance**	**P4 + Flood resilience**	**P3, P4 or P5 + Management of catchment run-off**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	4.02	18.82	11.575	4.33	4.02	<£4.02m	£1m with a 10% reduction in flow. A reduction of 10% in peak flow would have a big impact on flood damages. There are not enough opportunities to achieve this outcome More realistic is £4m to £3m
	Number of properties at risk (1% AEP from MDSF)	505	1842	1187	533	505	<505	480
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£317k	0	£150k	£317k Plus small scale capital costs in urban locations to improve conveyance	£600k	£600k Plus the cost of resilience which is not known at present	£600k It would not be possible to achieve this outcome even with very large scale capital investment
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	1136	4145	2672	1199	1136	<1136	
	Vulnerable people at risk (SFVI 4 or 5)	394	1451	935	420	394	<394	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.55	0.55	0.55	0.55	0.55	+ or - 0.55	+ or - 0.55
	Length of river restored (km)	13	Up to 5km Assumes that some of the watercourses return to a more natural state	0	Up to 5km Through the application of PPS25 and redistribution of maintenance activity	Less than 5km	Less than 5km	Up to 5km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						

To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	1 water dependent SSSI	Negative Work is needed as part of the WLMP: Management should aim to maintain the habitats associated with shallowly sloping margins that are not too exposed to wave action standing open waters	Negative: Work is needed as part of the WLMP: Management should aim to maintain the habitats associated with shallowly sloping margins that are not too exposed to wave action standing open waters	Neutral to Positive Providing actions from the WLMPS are implemented: Management should aim to maintain the habitats associated with shallowly sloping margins that are not too exposed to wave action standing open waters	Neutral to Positive Providing actions from the WLMPS are implemented: Management should aim to maintain the habitats associated with shallowly sloping margins that are not too exposed to wave action standing open waters	Neutral to Positive Providing actions from the WLMPS are implemented: Management should aim to maintain the habitats associated with shallowly sloping margins that are not too exposed to wave action standing open waters	Neutral to Positive Providing actions from the WLMPS are implemented: Management should aim to maintain the habitats associated with shallowly sloping margins that are not too exposed to wave action standing open waters
			Tewinbury: The site comprises a series of alluvial meadows and marshes bordering the River Mimram and a small piece of Alder woodland. It is in unfavourable, but recovering condition. The pastures which were traditionally managed for grazing are a feature of lowland Britain, but changes in agricultural practice have severely reduced the extent and quality of this habitat. The WLMP defines the appropriate balance of open water, swamp/reedbed and wet woodland.					

Middle Lee and Stort			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance, Enforcement, Application of PPS25, Telemetry and flood warning improvements**	**P3 + Strategic application of PPS25 to achieve optimal location, layout and design of redevelopment (eg Bishops Stortford), Management of urban run-off (eg Harlow, Stanstead), Removal of restrictions to flow in urban areas, Safeguard key open space**	**P4 + Flood resilience (for example in Hertford, Ware and Bishops Stortford)**	**P4 + maintaining or enhancing the capacity of the natural floodplain, BAP creation, WLMPs.**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	8.57	42.28	£15.0m	9.73	8.57	£2.0m	£2.0m Damages are based on being able to attenuate 10% of flood flows.
	Number of properties at risk (1% AEP from MDSF)	2213	6337	4621	2905	2213	1869	1869
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£663k	0	£300k	£663k	£500k Reduced maintenance costs, with more resource allocated to influencing redevelopment (additional £100k per year)	£500k Plus some capital costs. It is not possible to define capital costs at this stage.	£500k Plus some capital costs to bring about greater attenuation. It is not possible to define capital costs.
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	4979	14258	10397	6536	4979	4205	4205

	Vulnerable people at risk (SFVI 4 or 5)	700	1996	1456	915	700	589	589
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	4.96	<4.96	<4.96	4.96	>4.96	>4.96	>4.96
	Length of river restored (km)	31	0	0	0	Up to 5km	Up to 5km	Up to 5km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Ryemeads (part of Lee valley SAC)	+'ve or –'ve This policy option would need a much fuller assessment The overall requirement is for partial winter flooding, including retaining flood water on the site into the spring. There are many finer aspects of water level and flood management needed at this stie.	+'ve or –'ve This policy option would need a much fuller assessment The overall requirement is for partial winter flooding, including retaining flood water on the site into the spring. There are many finer aspects of water level and flood management needed at this stie.	+'ve or –'ve Very dependent upon how the policy is implemented at the specific site. The overall requirement is for partial winter flooding, including retaining flood water on the site into the spring. There are many finer aspects of water level and flood management needed at this stie.	+'ve or –'ve Very dependent upon how the policy is implemented at the specific site. The overall requirement is for partial winter flooding, including retaining flood water on the site into the spring. There are many finer aspects of water level and flood management needed at this stie.	+'ve or –'ve Very dependent upon how the policy is implemented at the specific site. The overall requirement is for partial winter flooding, including retaining flood water on the site into the spring. There are many finer aspects of water level and flood management needed at this stie.	+'ve The overall requirement is for partial winter flooding, including retaining flood water on the site into the spring. There are many finer aspects of water level and flood management needed at this stie.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	5 water dependent SSSIs	Negative Little Hallingbury Marsh is dependent upon the operation and maintenance of water level control structures and Thorley Flood pound requires periodic ditch clearance.	Negative or Neutral Depending upon the level of maintenance undertaken at Thorley Flood Pound and Hallingbury Marsh	Neutral Providing maintenance continues	Neutral for 2 sites and potentially negative at Rye Meads and Sawbridgeworth Marsh where regular winter flooding is required.	Reducing the frequency of flooding would have negative impacts at 3 sites.	Positive Providing the policy can be implemented to allow the optimum level of winter flooding, water level control structures are maintained and ditch clearance is continued at Thorley Flood Pound.
			Rye Meads meadows are the last substantial remnants of ancient flood-meadows on the rich alluvial soils of the Lea Valley. The site supports one of the largest areas of tall fen vegetation in the county and provides a valuable habitat for locally uncommon plants and for birds. This habitat has been reduced in extent significantly, both locally and nationally, by drainage and agricultural improvements, and it is now a rare habitat. Partial winter flooding is important in maintaining suitable habitat conditions for wintering birds. A mosaic of winter flooded grassland and permanently un-flooded grassland is desirable, with both temporary and permanent pools present. **Thorley Flood Pound** is situated in the Stort Valley on the Hertfordshire-Essex border and contains a range of habitats associated with a fluctuating water table. These include tall wash grassland, baserich marsh and ill-drained permanent grassland, with a rich assemblage of plant species. These habitats were once widely distributed in southern Britain but, as a result of agricultural changes, in particular drainage, they are now greatly diminished; tall wash grassland is a rare habitat type both in Essex and in Britain as a whole. The Environment Agency undertook					

			restoration work on Thorley in summer 2004 while carrying out works to decommission the flood pound. Unfortunately the site has begun to scrub up with willow and the ditches require clearing. Without continued management the site will decline further. Winter flooding is an important factor in the management of floodplain habitats and management should ensure the frequency and extent of flooding is appropriate for maintaining the nature conservation interest of the site. **Sawbridgeworth Marsh** is one of the few remaining intact river valley marshes in Hertfordshire comprising habitats now much reduced in extent in southern Britain owing to drainage and agricultural improvement. The neutral alluvium of the River Stort's narrow food plain here supports a diverse wetland flora. The habitat grades from reed bed and tall mixed fen communities through acid marshy grassland dominated by rushes, to neutral grassland on drier sloping ground. Winter flooding is an important factor in the management of floodplain habitats and management should ensure the frequency and extent of flooding is appropriate for maintaining the nature conservation interest of the site. **Hunsdon Mead** is a registered Common and is one of the last remaining sites in Essex or Hertfordshire to still be managed on the ancient Lammas system of hay making followed by winter grazing. The site forms a large area of unimproved grassland on alluvial soils subject to occasional winter flooding. **Little Hallingbury Marsh** is an area of unimproved wet grassland and fen adjacent to the River Stort and about 3km south of Bishop's Stortford. It lies on alluvial soils with varying patterns of drainage and as a result contains an interesting and important assemblage of swamp communities. These communities contain many plant species uncommon and declining in Essex. The wettest area is dominated by Reed Sweet-grass *Glyceria maxima*, while the ditches and their margins support another typical flood-plain plant community dominated by branched bur-reed *Sparganium erectum*. The drier areas of the fen are characterised by a herb-rich lesser pond-sedge *Carex acutiformis* swamp. The present distribution of the plant communities is the result of impeded drainage in the last 50 years. Maintaining and operating water level control structures are crucial to the sustainability of the site.

Lower Lee			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance, Application of PPS25, Maintain the current Lower Lee defences**	**P3 + Strategic application of PPS25, Floodplain and river corridor redevelopment to reduce flood risk (focus on layout and design, open space safeguarded**	**P4 + Urban drainage planning, SUDS, Flood resilience**	**Cannot be applied in this policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	31.9	Up to £400m	£80m	£43.81m (Modelling may have over-estimated these damages)	£31.9m (Modelling may have over-estimated these damages)	£20m	
	Number of properties at risk (1% AEP from MDSF)	21490	43260	34094	24928	21490	1600 (Based on the application of the P6 policy in the Lower Lee tributaries and the Middle Lee and Stort policy units)	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£952k	0	£400k	£952k	£952k Plus £200k per year for five years to ensure appropriate adaptation of the urban	£952k Plus £200k per year for five years to ensure appropriate adaptation	

						environment	of the urban environment The potential cost of storage options in the other policy units is considered within those units (Lower Lee tributaries and Middle Lee and Stort)	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	48353	97335	76712	56088	48353	3600	
	Vulnerable people at risk (SFVI 4 or 5)	28397	57428	45260	33092	28397	2124	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	4.55	<4.55	<4.55	4.55	>4.55	>4.55	
	Length of river restored (km)	85	Up to 40km Assumes that some of the watercourses return to a more natural state	Up to 20km	0km	Up to 10km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	Up to 10km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Lee valley SAC	-'ve The requirements are very site specific and are dependent upon local operational practice or future design.	-'ve or +'ve The requirements are very site specific and are dependent upon local operational practice or future design.	-'ve or +'ve The requirements are very site specific and are dependent upon local operational practice or future design.	-'ve or +'ve The requirements are very site specific and are dependent upon local operational practice or future design.	-'ve or +'ve The requirements are very site specific and are dependent upon local operational practice or future design.	-'ve or +'ve The requirements are very site specific and are dependent upon local operational practice or future design.
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	4 SSSI's with some water dependence,	Negative Abstraction to maintain water levels in the reservoirs are dependent upon water level control within the Lower Lee	Negative Abstraction to maintain water levels in the reservoirs are dependent upon water level control within the Lower Lee	Neutral or Positive Through water level control and measures to restore natural systems	Neutral or Positive Through water level control and measures to restore natural systems	Neutral or Positive Through water level control and measures to restore natural systems	Neutral or Positive Through water level control and measures to restore natural systems
			Cornmill Stream and Old River Lea: The physical features of the river or stream (its natural structure and form) should be maintained as far as possible in their natural state. This will support a natural flow regime that will help conserve the geomorphological features of interest. **Walthamstow Marshes** are one of the last remaining examples of semi-natural wetland in Greater London. They contain a variety of plant communities typical of a former flood plain location, such as a range of neutral grassland types, sedge marsh, reed swamp, sallow scrub and areas of tall herb vegetation. **The Chingford Reservoirs and Walthamstow Reservoirs** are one of the major wintering grounds for wildfowl and wetland birds in the London area and hold nationally important numbers of some species. The reservoirs also form a moult refuge for large populations of wildfowl during the					

			late summer months. The goosander, a fish-eating species, are especially noted for their habit of feeding in the concrete lined River Lee Flood Relief Channel along the eastern margin of the reservoir embankments.

Lower Lee Tributaries			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**Maintain conveyance in urban areas from previous improvements, Application of PPS25**	**Strategic application of PPS25, Floodplain and river corridor redevelopment to reduce flood risk (focus on layout and design, open space safeguarded, SUDS and urban drainage planning**	**Flood Defences (assumes 5 schemes comprising flood walls and embankments reducing risk to 500 properties each)**	**P4 approaches + Upstream Flood Storage (approx 10% of flood flows) on five river systems**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£7.91m	£22.51m	£16.5m	£10.49m	£7.91m	£5.4m	£5.5m
	Number of properties at risk (1% AEP from MDSF)	5433 properties	8125	8125	8125	5433	2933 (But could increase the risk to properties downstream in the Lower Lee)	3566
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£361k on maintenance	0	180k	£361k	£361k maintenance Along with an increase in revenue expenditure to bring about the level of influencing needed (perhaps 1 to 2 FTE's, up to £100k for five years)	£361k maintenance Capital construction costs in the range £2m to £5m per scheme. Total likely to be £10m to £25m.	£361 maintenance Capital construction costs in the range £2m to £10m per scheme depending upon the complexity
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	12224 people	18281	18281	18281	12224	6599	8024
	Vulnerable people at risk (SFVI 4 or 5)	6395 people	9506	9506	9506	6395	3431	4172
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.21 km^2	0.21 km^2	0.21 km^2	0.21 km^2	> 0.21 km^2	0.21 km^2	> 0.21 km^2
	Length of river restored (km)	73km of maintained river	0	0	Up to 5km	Up to 25km Based on rivers being restored alongside redevelopment of the river corridor	0 to 15km This is less than for P4 or P6 recognising the presence of linear flood defences	Up to 25km Based on rivers being restored alongside redevelopment of the river corridor
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Epping Forest	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional flood defence activity is planned.	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional flood defence activity is planned.	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional flood defence activity is planned.	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional flood defence activity is planned.

			where no additional flood defence activity is planned.	flood defence activity is planned.				
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Middle and Lower Roding			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, Enforcement, Application of PPS25**	**P3 + Safeguard the existing floodplain and areas that may be needed for future flood risk management purposes, Surface water management planning, Strategic application of PPS25**	**P4 + Flood resilience or upstream storage**	**Not applicable in this policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	2.3	At least £5m (pending TE2100 study)	£5m to £3m	2.8	2.3	£2m to £1m	
	Number of properties at risk (1% AEP from MDSF)	2468	5958	4371	2784	2468	1500 to 2400	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£537k	0	£265k	£537k	£537k Plus £100k per year for five years to ensure appropriate adaptation of the urban environment	< £537k Plus capital costs in the range £2m to £10m. This should lead to a reduction in the current maintenance costs	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	6276	13406	9835	6264	6276	3375 to 5400	
	Vulnerable people at risk (SFVI 4 or 5)	4836	10323	7573	4823	4836	2599 to 4158	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	1.94	1.94	1.94	1.94	1.94	1.94	
	Length of river restored (km)	13	Up to 3km Assumes that some of the watercourses return to a more natural state	0	0	Up to 5km	Up to 5km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						

To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Upper Roding			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages in urban locations**	**P2 + Maintain conveyance in urban locations, Enforcement, Application of PPS25, Telemetry and flood warning improvements**	**P3 + Safeguard the existing floodplain and areas that may be needed for future flood risk management purposes, Flood Resilience, WLMPs**	**P4 + Widespread Flood Resilience**	**P3, P4 or P5 + maintaining or enhancing the capacity of the natural floodplain, engineered flood storage, BAP creation**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£3.43	7.34	3.67	£2.5	£3.43	£1.8m (Assuming 10% penetration of resilience measures)	£1.6m (Assumes that 10% of flood flows are attenuated)
	Number of properties at risk (1% AEP from MDSF)	1629	2819	2291	1763	1629	1450	1480
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£426k	0	£200k	£426k	£426k	£426k The cost of resilience measures is not known at present	£300k to £426k Reduced maintenance outside urban areas could be compatible with increased attenuation and BAP creation in the Upper Roding. It is not yet clear whether this level of benefit can be attained without engineered storage.
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	3665	6343	5155	3967	3665	3263	3330
	Vulnerable people at risk (SFVI 4 or 5)	1258	2157	1753	1349	1258	1109	1132
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	1	1	1	1	1	1	>1
	Length of river restored (km)	5	0	0	0	0	0	0
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	Epping Forest	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional flood defence activity is planned.	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional flood defence activity is planned.	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional flood defence activity is planned.	Only a tiny proportion of the SAC is in the floodplain and this is at the headwaters of minor tributaries where no additional flood defence activity is planned.

			where no additional flood defence activity is planned.	flood defence activity is planned.				
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	1 water dependent SSSIs	Negative Intervention is required to maintain drainage	Neutral Providing there is periodic flooding and maintenance of drainage	Neutral Providing there is periodic flooding and maintenance of drainage	Neutral or Positive Providing there is periodic flooding and maintenance of drainage. However, it is assumed that WLMP actions can be carried out effectively under this policy option.	Neutral or Positive Reducing the periods of inundation could have negative impacts on the site. It is assumed that WLMP actions can be carried out effectively under this policy option.	Neutral or Positive Periodic flooding is beneficial to the site in combination with the maintenance of drainage. It is assumed that WLMP actions can be carried out effectively under this policy option.
			Roding Valley Meadows form one of the largest continuous areas of species-rich grassland in Essex, comprising traditionally managed hay meadows, flood meadows and marsh. Situated in the gently sloping floodplain of the River Roding, the area is divided into several small fields by a long established system of hedges and ditches. The River Roding and associated riparian fringe is an integral and valuable part of the site. For the damper meadows, regular and careful maintenance of surface drainage including ditches and drains can be necessary to prevent adverse changes in the plant species composition of the sward. Deepening of surface drainage should be avoided.					

Beam			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance and the capacity of the natural floodplain in the middle reaches of the Beam, Application of PPS25, Maintain Washlands FSA, Safeguarding open space**	**P3 + Strategic application of PPS25 e.g. Romford: River corridor redevelopment to reduce flood risk (focus on layout and design, Urban Drainage and widespread adoption of SUDS e.g. Romford**	**P4 + Flood resilience, Land swapping of vulnerable property**	**Not applicable in this urban policy unit**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	0.7	1.91	1.43	0.95	0.7	<£0.7m	
	Number of properties at risk (1% AEP from MDSF)	421	2442	1509 There is a large increase in the properties at risk under this policy because of the risk of blockages in this policy unit	576	421	<421 It is not certain how effective flood resilience would be in such a fast responding catchment	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£200k	0	£100k	£200k	£200k Plus £100k per year for five years to ensure appropriate adaptation of the urban environment	£200k Plus costs of resilience which are not certain at present	

Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	947	5495	3395	1296	947	<947	
	Vulnerable people at risk (SFVI 4 or 5)	275	1594	985	376	275	<275	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.01	0.01	0.01	> = 0.01	> 0.01	> 0.01	
	Length of river restored (km)	3	0	0	0	Up to 2km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor in Romford	Up to 2km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor in Romford	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in this policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in this policy unit						

Ingrebourne			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance, Application of PPS25**	**P3 + Strategic application of PPS25: River corridor redevelopment to reduce flood risk (focus on layout and design, Urban Drainage and widespread adoption of SuDs eg upper reaches**	**P4 + Flood resilience (including those areas at risk from tidal and fluvial flooding)**	**Only locally applicable**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	5.97	>> 8.91 Not yet understood because of the interaction between tidal and fluvial flooding	8.91	8.21	5.97	<£5.97m	£4.7m with a 10% reduction in flow. A reduction of 10% in peak flow would have a big impact on flood damages. There are not enough opportunities to achieve this outcome More realistic is £5m to £5.9m
	Number of properties at risk (1% AEP from MDSF)	1095	1163	1163	1163	1095	<1095	480

Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£580k	0	£280k	£580k	£580k Plus £50k per year for five years to ensure appropriate adaptation of the urban environment	£580k Plus the cost of resilience which is not known at present	£600k It would not be possible to achieve this outcome even with very large scale capital investment
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	2464	1559	2088	2617	2464	<2464	1080
	Vulnerable people at risk (SFVI 4 or 5)	1350	857	1148	1439	1350	<1350	594
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	4.4	4.4	4.4	4.4	4.4	4.4	4.4
	Length of river restored (km)	2km	Up to 1km	0	0	Up to 1km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	Up to 1km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor	Up to 1km Assumes that redevelopment leads to a different urban layout that provides the opportunity to restore parts of the river corridor
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	2 water dependent SSSIs	Tidal marshes, being considered in the TE2100 project	Tidal marshes, being considered in the TE2100 project	Tidal marshes, being considered in the TE2100 project	Tidal marshes, being considered in the TE2100 project	Tidal marshes, being considered in the TE2100 project	Tidal marshes, being considered in the TE2100 project

Ravensbourne			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance, Application of PPS25**	**P3 + River corridor redevelopment to reduce flood risk (focus on layout and design, open space safeguarded, Optimal balance of attenuation and conveyance, Sustainable flood alleviation schemes e.g. Deptford, widespread adoption of SuDs**	**P4 + Flood resilience**	**P4 + attenuation within the available open space in the catchment (attenuating up to 10% of peak flow)**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£22.72m	53.06	37.795	28.53	22.72	< 22.72	£18m
	Number of properties at risk (1% AEP from MDSF)	6575 properties	15431	11535 Reductions in	7639	6575	< 6575 Because the	5900

				maintenance would impact on properties at risk and damages because of the potential for blockages at structures			Ravensbourne is such a fast responding catchment we cannot be certain on the outcome of resilience measures	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£607k	0	£300k	£607k	£607k + Some capital expenditure associated with the re-creation of river corridors alongside redevelopment. Along with a short-term increase in revenue expenditure to bring about the level of influencing needed (perhaps 1 to 2 FTE's, up to £100k for five years). £2-4m capital costs at Deptford.	£607k + In the Ravensbourne policy unit where there is little open space, reducing the probability of flooding would be more reliant on resilience than defences. At present we do not know the cost of resilience measures.	£607 + Capital costs are likely to be high. To implement five schemes comparable to the Quaggy would have a capital cost in the range £40m to £80m
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	14794	34720	25954	17188	14794	<14794	13275
	Vulnerable people at risk (SFVI 4 or 5)	4934	11458	8565	5672	4934	<4934	4381
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.21	0.21	0.21	0.21	> 0.21	0.21	> 0.21
	Length of river restored (km)	30	0	0	Up to 5km	Up to 6km	Up to 6km	Up to 6km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in the policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in the policy unit						

Graveney			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance, Application of PPS25**	**Flood Resilience, Attenuation at Norbury Park**	**P4 + Widespread adoption of Flood resilience, Land swapping, River corridor redevelopment to reduce flood risk (focus on layout and design)**	**Could not be implemented in the Graveney**

							Could not be implemented at present	
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£1.1m	19.06	9.53	1.4	1.1	0.95	
	Number of properties at risk (1% AEP from MDSF)	3899	6000	5121	4242	3899	3600	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£75k	0	£40k	£75k	£75 to £200k Plus capital costs in the range of £2m to £20m	£75 to £200k Plus capital costs in the range of £2m to £20m	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	8773	13500	11522	9545	8773	8100	
	Vulnerable people at risk (SFVI 4 or 5)	2695	4185	3572	2959	2695	2511	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0	0	
	Length of river restored (km)	9	0	0	0	Up to 1km	Up to 9km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in the policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in the policy unit						

Wandle			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance, Application of PPS25**	**P3 + River corridor redevelopment to reduce flood risk (focus on layout and design, open space safeguarded, Optimal balance of attenuation and conveyance, Urban Drainage Plans**	**P4 + Flood resilience and local defences**	**P3, P4 or P5 + attenuation within the available open space in the floodplain.**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£6m	£208.34m The modelling has over-estimated these damages	£104.17m The modelling has over-estimated these damages	£8m	£6m	< 6m	
	Number of properties at risk (1% AEP from MDSF)	6215	12372	9626.5	6881	6215	< 6215	

Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£239k	0	£120k	£239k	£239 to £400k, then reducing in the long-term Some capital expenditure associated with the re-creation of river corridors alongside redevelopment. Along with a short-term increase in revenue expenditure to bring about the level of influencing needed (perhaps 1 to 2 FTE's, up to £100k for five years)	£239 to £400k There are options to reduce the probability of flooding to some areas. We do not know the potential cost of these options.	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	13984	27837	21660	15482	13984	<13984	
	Vulnerable people at risk (SFVI 4 or 5)	4093	8073	6281	4490	4093	<4093	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0.01	0.01	0.01	0.01	0.2	0.4	0.4
	Length of river restored (km)	9	0	0	Up to 3km	> 3 km	> 3 km	> 3 km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in the policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in the policy unit						

Beverley Brook			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance, Application of PPS25**	**P3 + River corridor redevelopment to reduce flood risk (focus on layout and design, open space safeguarded, Some resilience or local defence improvements, Optimal balance of attenuation and conveyance, Widespread adoption of SuDs, Urban Drainage Plans**	**P4 + Widespread Flood resilience or defences**	**P6 cannot be realistically implemented in the Beverley brook because there is so little open space in the headwaters**

Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	14.01	£79m	£35m	£28m	£14.01m	< 14.01m	
	Number of properties at risk (1% AEP from MDSF)	5807	7826	7100	6400	5807 Levels of redevelopment in the catchment are not high, so local defence improvements would be needed to offset the impacts of climate change.	< 5807	
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£193k	0	£100k	£193k	£193k + Significant capital costs to achieve a different balance between conveyance and attenuation. These cannot be defined at present.	£193k + There are options to reduce the probability of flooding to some areas. We do not know the potential cost of these options.	
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	13066	17609	15975	14400	13066	<13066	
	Vulnerable people at risk (SFVI 4 or 5)	971	1233	1118	1008	971	<971	
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0.1	0.2	
	Length of river restored (km)	12	0	0	Up to 2 km	> 2 km	Up to 2 km	
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in the policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in the policy unit						

Hogsmill			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance in urban areas, Application of PPS25, Safeguard open space**	**P3 + Strategic application of PPS25: River corridor redevelopment to reduce flood risk (focus on layout and design) Urban Drainage and widespread adoption of SuDs Restoration of river corridors**	**P4 + Flood resilience**	**P4 + Optimum balance between conveyance and attenuation within the policy unit Attenuation within the Middle and Upper catchment**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	3.81	14.67	9.51	4.35	3.81	< 3.81	£2.75m

	Number of properties at risk (1% AEP from MDSF)	1138	5690	3618	1546	1138	< 1138 Because the Hogsmill is such a fast responding catchment we cannot be certain on the outcome of resilience measures	1020
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£114k	0		£114k	£114k Plus 1 FTE to facilitate changes in approach (£50k per year for five years)	£114k + At present we do not know the cost of resilience measures.	£114k + Capital costs of storage. Likely to be in the range of £2m (for a very simple scheme) to £15m (for a more complex scheme like the Quaggy).
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	2561	12803	8141	3479	2561	<2561	2295
	Vulnerable people at risk (SFVI 4 or 5)	1103	2048	1303	557	1103	<1103	367
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	0	0	>0
	Length of river restored (km)	9	0	0	Up to 1km	Up to 2km	Up to 2km	Up to 2km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in the policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	None in the policy unit						

Crane			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**P2 + Maintain conveyance, Application of PPS25, Maintain Hayes Flood Storage Area**	**P3 + Strategic application of PPS25: River corridor redevelopment to reduce flood risk (focus on layout and design, open space safeguarded, Urban Drainage and widespread adoption of SUDS eg Yeading Brook**	**P4 + Flood defences**	**P4 + Multiple use of open spece in the middle part of the Crane eg BAP creation or recreation**
Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	15.58	27.23	24.72	20.82	15.58	Small reduction on £15.58m	14.07 Relatively moderate impact from

								attenuation in the middle reaches of the policy unit.
	Number of properties at risk (1% AEP from MDSF)	7658	9945	9272	8599	7658	Small reduction on 7658 The impact of defences in the Crane is likely to be limited because the risk is distributed in a linear pattern along the river. Lots of defences would be needed to reduce risk.	6900
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£320k	0	£180k	£320k	£320k Plus 1 FTE to facilitate changes in approach (£50k per year for five years)	£320k	£320k
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	17231	22376	20862	19348	17231	<17231	15525
	Vulnerable people at risk (SFVI 4 or 5)	2837	3804	3547	3289	2837	<2837	2639
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	0	0	0	0	Up to 0.5	0	Up to 0.5
	Length of river restored (km)	8	0	0	Up to 1 km	> 1 km	> Up to 1km	Up to 2 km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in the policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	1 water dependent SSSI	The SSSI is in the tidal floodplain of the River Thames	The SSSI is in the tidal floodplain of the River Thames	The SSSI is in the tidal floodplain of the River Thames	The SSSI is in the tidal floodplain of the River Thames	The SSSI is in the tidal floodplain of the River Thames	The SSSI is in the tidal floodplain of the River Thames

Brent			**Impact of Policy options to 2050 to 2100**					
Objective		**Baseline**	**Policy 1**	**Policy 2**	**Policy 3**	**Policy 4**	**Policy 5**	**Policy 6**
	Typical approaches		**Do Nothing**	**Flood Warning, Emergency maintenance to remove blockages, scrutiny of high risk planning applications**	**Maintain conveyance in urban areas from previous improvements, Application of PPS25**	**Strategic application of PPS25, Urban drainage planning River corridor redevelopment to reduce flood risk (focus on layout and design, open space safeguarded, Optimal balance of attenuation and conveyance**	**P4 + Flood Defences (assumes 5 schemes comprising flood walls and embankments)**	**P4 + Localised flood storage**

Manage the economic impacts of flooding on property	**Economic Damages** (£m AAD from MDSF)	£4.75m	£20.24m	£13.49m	£6.74m	£4.75m	£3.5m	£3.95m
	Number of properties at risk (1% AEP from MDSF)	2668 properties	9185	6163 Reductions in maintenance would impact on properties at risk and damages because of the potential for blockages at structures	3141	2668	2000 The impact of defences in the Brent is likely to be limited because the risk is distributed in a linear pattern along the river. Lots of defences would be needed to reduce risk.	2400 Properties at risk and damages are based on attenuating 10% of peak flows
Ensure future investment in the catchment is proportional to the risk	Levels of activity are proportional to the risk (Baseline is maintenance expenditure - £k) per year	£683k on maintenance	0	£340k	£683k	£683k Some capital expenditure associated with the re-creation of river corridors alongside redevelopment. Along with a short-term increase in revenue expenditure to bring about the level of influencing needed (perhaps 1 to 2 FTE's, up to £100k for five years)	£683k + Perhaps £10-25m capital costs.	£683 + Capital costs for flood storage and retrofitting SUDS. Unknown at this stage. Likely to be in the 10s of millions.
Minimise flood related risks to the population	**People at risk** (1% AEP People at risk)	6003 people	20666	13867	7067	6003	4500	5400
	Vulnerable people at risk (SFVI 4 or 5)	2320 people	8060	5408	2756	2320	1755	2106
To enhance and expand floodplain BAP habitat and restore urban watercourses	**Area of BAP habitat** (km^2)	1.02 km^2	1.02	1.02	1.02	1.02	1.02	1.02
	Length of river restored (km)	40km of maintained river	0	0	Up to 5 km	Up to 8 km (assuming that 20% of the river corridor is redeveloped)	0 to 8 km	Up to 8 km
To preserve or enhance the condition of internationally designated sites	**Potential impact on internationally designated conservation sites** (SACs, SPAs & Ramsars)	None in the policy unit						
To preserve or enhance the condition of nationally designated sites	**Potential impact on nationally designated conservation sites** (SSSIs)	1 SSSI	Brent Reservoir: is operated by British Waterways.					

	Summary of the Preferred Approach					
Policy Unit	**Upper Thames**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**2.2%**	of the economic consequences of fluvial flooding in Thames region				
	1.5%	of the social consequences of fluvial flooding in Thames region				
	35%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			4800		6280	
Properties (from MDSF)	2358	2933	3735	4290		
Total Damages (£m from MDSF)	46.53	72.38	137.30	180.20		11.21
Projected Damages (£m)						13.71
Residential Damages						4.46
Commercial Damages						6.75
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	2955	3483	4376	4555		
Climate Change (Damages)	72.13	114.50	197.57	235.39		13.84
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	597	550	641	265		
Damages: Actual	25.59	42.11	60.27	55.18		2.63
Properties: % Change	21.7%	25.3%	18.8%	17.2%	6.2%	
Damages: % Change	55.0%	58.2%	43.9%	30.6%		23.5%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-11.79%	-10.13%	-12.26%	-8.51%		
Damages (%)	-17.03%	-22.46%	-27.01	-16.27%		-19.48%
	Impact of Scenario's on 1% AEP					
	16Mm³ Upper Thames Storage	100% storage - Cherwell	-10% flows in Upper Thames	-5% flows in Upper Thames		
Properties: Actual	3643	1284	3277	3510		
Damages: Actual	134.43	52.93	100.27	117.26		
Properties: % Baseline change	-2.5%	-65.6%	-12.3%	-6.0%		
Damages: % Baseline change	-2.1%	-61.5%	-27.0%	-14.6%		
Main clusters or features of the current flood risk	Properties at risk are generally widely dispersed across the policy unit. The main clusters are Banbury, Cirencester and Witney					
Area of BAP (km)	Approximately 60km^2 of floodplain BAP habitat (predominantly floodplain grazing marsh with small areas of fen and reedbed).					

Floodplain area	312km^2 of floodplain (96% undeveloped and 4% urban)		
Watercourse length	2500km of which 1239km is natural channel		
Description of designated sites and BAP	There are six SSSIs that have been recognised at European level in this policy unit. For each of these sites, flood risk management policy and practice has a direct impact on the conditions of the site. Four are collectively designated as the **Oxford Meadows** SAC. Oxford Meadows includes vegetation communities that are extremely rare across the world, reflecting the influence of long-term grazing and hay cutting on lowland meadows. The Oxford Meadows are critically dependent on groundwater levels and annual flooding. The remaining two SSSIs make up North Meadow and Clattinger Farm SAC. This is considered to be one of the best areas of lowland hay meadows in the UK. To maintain the habitat, winter flooding should be maintained and if possible increased.		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx £1100k.**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	480k	450k	170k
Where	11 lock and weir complexes on the Thames (St John's to Godstow)	Witney Banbury Cirencester Bicester Kidlington	Radcott Cut c.50 other systems
Purpose of Maintenance	There are very few major defences in the Upper Thames and maintenance is aimed at maintaining the capacity of the natural channel to convey flow to reduce the risk of low order flooding (up to 5 to 10% AEP). Maintenance expenditure per length of watercourse is low in the Upper Thames, whilst expenditure per property at risk is above average for the region. This can be expected in the Upper Thames where there are relatively few flood defences and a greater dependence upon watercourse maintenance to manage the probability of flooding. A typical system in the Upper Thames is the Radcot Cut system, classified as medium risk and covering the villages of Clanfield, Brize Norton and Bampton. Here the maintenance regime comprises an annual clearance in the Autumn (weed cutting, bank clearance and the removal of woody obstructions) through the villages. Occasionally localised de-silting takes place. In general the capacity of the watercourses through these villages is limited by the capacity of structures (mainly bridges) to convey flow so increasing channel capacity beyond the capacity of the structures would have no impact. No maintenance is carried out outside of the villages. On the whole, the distribution of maintenance is proportional to risk within the Upper Thames policy unit. The 35km of agricultural defences in the Upper Thames will not be maintained by the Environment Agency (reflecting current practice).		
Approximate Standards of service that apply	Natural floodplain: 100% to 20% AEP Market towns and villages such as Witney and Standlake: 10% to 2% AEP Kidlington: 1% AEP		
Flood Warning	Proportion signed-up to FWD	20%	

(activities planned in 2008-09)	Detection Improvements: Site planned at Bampton, Moreton in Marsh, Wantage and Witney Flood Awareness Events: Cotswolds - Flood Protection Products Fair (May 08) Forecasting Improvements: Refinements to existing hydrodynamic model Routing models to be delivered Rainfall runoff models to be delivered
Opportunities & Constraints	Maintaining or enhancing floodplain capacity to store water to provide direct environmental benefit and small, localised economic and social benefits. Small to moderate scale redevelopment of towns provides an opportunity to gradually reduce the consequences of flooding.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).
Justification (Balancing Objectives)	The policy has been selected for the Upper Thames because it offers the most potential to; • Enhance and expand floodplain BAP habitat • Maintain or improve the condition of designated sites • Reduce flood risk to people and property downstream • Reduce flood risk to some people and property within the policy unit The actions are designed to take some of the initial steps in meeting these objectives.

	Implementation of P6 in the Upper Thames can potentially have positive impacts on all indicators within the policy unit and contribute to reducing flood risk downstream. For example, reducing flows across the whole of the Upper Thames by 10% would reduce the number of properties at risk in downstream policy units: Oxford: -14% Sandford to Cookham: -17% Reading: -3% Lower Thames: -3% Together such attenuation could reduce flood risk to 500 to 1000 properties along the River Thames in downstream policy units and to properties within the Upper Thames itself. It is highly unlikely that this level of attenuation could be achieved though natural processes and it would need some form of engineered flood storage. The feasibility and cost of storage is uncertain, but the positive potential impacts across all indicators inside and outside of the policy unit justify the selected policy. The potential (at a technical level) to enhance and expand the existing habitat is very high in the Upper Thames. The existing habitat is significant at a regional scale, there is potential for improvement and this would be compatible with our aim of maintaining or enhancing the capacity of the natural floodplain to store water. The areas where there is the highest potential for wetland BAP creation are on the lower-lying, flatter areas of floodplain along the Thames and the downstream reaches of the Cherwell. This is where the relevant geology and environmental conditions overlap with areas with a high groundwater table and/or that are inundated with floodwaters. There is also high potential in a number of catchments in the Upper Thames, for both land use and land management change. These factors have been the primary drivers for the policy selection. The selected policy supports the requirement for regular flooding to the internationally designated sites that make up the Oxford Meadows SAC and the maintenance of water levels at North Meadow and Clattinger Farm SAC. FRM priorities will mean that there are limits in how far we can implement this policy in the next 5 years. The intention is to achieve the selected policy (P6) across the whole of the Upper Thames. In most places we will be seeking to attenuate water, but recognise that across such a large policy unit we will not do this everywhere. One of the actions in the Action Plan proposes a broad assessment of some of the Making Space for Water principles (for example flood attenuation). Following this work it is likely that there will need to be a refinement of precisely how the policy will be implemented in the Upper Thames.
Key Actions (Developed in Action Plan)	**UT1 - Making Space for Water** **UT2 - Conveyance in urban locations** **UT3 - Effectiveness of maintenance** **UT4 - Flood warning, flood awareness and emergency planning** **UT5 - Land use planning** **UT6 - Progress existing improvement options and strategies that are complementary to the policy** **UT7 – Maintain specific defences**
Risks, Uncertainties & Dependencies	Dependent on the application of Making Space for Water principles (floodplain management, resilience and resistance measures) for a significant change. Dependent upon successful application of the sequential test, community engagement and acceptance of flood risk for an evolutionary change.
Regional	Low overall.

Priority (0-5yrs)	Some can be achieved through an evolution of approach and the priority recognises that the rate of change will be moderate.

	Summary of the Preferred Approach				
Policy Unit	**Swindon**				
	What is currently at risk from flooding: Problem / Risk				
Regional Context	**0.4%**	of the economic consequences of fluvial flooding in Thames region			
	0.3%	of the social consequences of fluvial flooding in Thames region			
	2.3%	of the floodplain, channel and designated environmental assets in Thames region			
	Current Risk				
	20% AEP	**5% AEP**	**1% AEP**	**0.1% AEP**	
Properties (from flood zones)			1030	1270	
Properties (from detailed modelling)					
Main clusters or features of the current flood risk	Covingham, Dorcan Brook, Lower Stratford and along the River Ray.				
Area of BAP (km)	6km^2 of floodplain BAP habitat (reedbed)				
Floodplain area	9.5 km² of which 15% is urban				
Watercourse length	49km of which approximately 2km is modified or artificial channel				
Description of designated sites	None				
	Current responses to flood risk within the policy unit				
Total Maintenance Expenditure	**Approx 310k**				
	Major Assets	**High Risk Systems**	**Low & medium Risk**		
Approx. Expenditure	16	293	1		
Where		River Ray River Cole Dorcan Brook			
Purpose of Maintenance	Removal of blockages and obstructions (e.g. from trash screens) and the maintenance of channel conveyance.				
Approximate Standards of service that apply	Typically 5% to 3% AEP				
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	1%			
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood Protection Products Fair (Jun 08) Forecasting Improvements: Routing models to be delivered				

Opportunities & Constraints	Redevelopment of sites within Swindon to; Reduce the consequences of flooding Increase the resilience to flooding Gain a river corridor where none exists at present Restore rivers Links with the Swindon Water cycle study which also considers surface water flooding risks. Major flood defences are not realistic in Swindon. Smaller scale defences or actions to improve urban conveyance by removing restrictions to flow are a possibility, but do not currently attract funding.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators as the condition of modified watercourses deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration of modified watercourses. Reductions in Development Control activity in this policy unit could also lead to an increase in inappropriate development in the floodplain as there is a lot of growth planned. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience, removing restrictions to flow or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from new defences. P6: Attenuation can reduce the risk to some people and property within the policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	Massive housing growth is planned for Swindon with up to 30,000 houses planned for the next twenty years. The intended outcome from the first action in the Action Plan is to ensure that none of these houses are located in the floodplain and that the run-off is managed such that there is no increase in flood risk elsewhere in the policy unit. The housing growth should not increase flood risk. Policy implementation in Swindon is expected to be gradual: • Over the coming decades, some areas of floodplain in Swindon will be redeveloped. We will be looking for this redevelopment to be resilient and resistant to flooding. This should lead to a gradual reduction in the

	consequences of flooding. • There are multiple sources of flooding in Swindon which is widely distributed across the policy unit. There are some locations where the flood risk is accentuated by existing restrictions to flow (e.g. at bridges and culverts). Removing some of these restrictions will reduce the probability of flooding to some locations – but is funding dependent. These approaches will reduce the consequences and probability of flooding in parts of the policy unit dependent upon the levels of redevelopment and funding. With over 1000 properties at risk this modest level of activity seems appropriate. Removing restrictions to flow may also present an opportunity to reduce the existing level of maintenance. The existing BAP habitat in Swindon is located outside of the town. The future management of the flood risk to people and property in Swindon is neutral with respect to BAP habitat.
Key Actions (Developed in Action Plan)	**Sw1 Land use planning - Location of new development and the management of run-off** **Sw2 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **Sw3 Surface water drainage** **Sw4 Maintaining conveyance and where practical increase its efficiency** **Sw5 Flood proofing and flood resilience** **Sw6 Maintenance of defences**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor and location of new development. Implementation of the proposed approach to implementing policy in Swindon is dependent upon; • Safeguarding open space • Adoption of appropriate policies within LDFs • Wider application of Making Space for Water principles (notably the use of open space in floodplains, flood resilience, urban drainage) • Funding New development in Swindon has the potential to increase flood risk. Currently this is being managed using PPS25.
Regional Priority (0-5yrs)	High. This priority reflects the broad range of opportunities to put in place long-term flood risk reductions.

	Summary of the Preferred Approach					
Policy Unit	**Oxford**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**2.2%**	of the economic consequences of fluvial flooding in Thames region				
	1.5%	of the social consequences of fluvial flooding in Thames region				
	0.9%	of the floodplain, channel and designated environmental assets in Thames region.				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			4674		5318	

Properties (from MDSF)	1939	3834	5433	5978		
Total Damages (£m from MDSF)	11.30	35.05	124.80	235.73		6.78
Projected Damages (£m)						5.83
Residential Damages						3.50
Commercial Damages						3.27
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	3965	5229	6334	6841		
Climate Change (Damages)	38.38	100.51	295.20	375.73		11.18
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	2026	1395	901	863		
Damages: Actual	27.08	65.45	170.40	140.00		4.40
Properties: % Change	104.5%	36.4%	16.6%	14.4%		
Damages: % Change	239.8%	186.7%	136.5%	59.4%		64.9%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-28.21%	-30.75%	-14.89%	-8.87%		
Damages (%)	-31.43%	-51.88%	-44.09%	-45.57%		-42.72%
	Impact of Scenario's on 1% AEP					
	16m cubic metres of upstream storage	100% storage on the Cherwell				
Properties: Actual	3463	4826				
Damages: Actual	28.07	73.56				
Properties: % Baseline change	-36%	-11%				
Damages: % Baseline change	-77%	-40%				
Main clusters or features of the current flood risk	The risk is most concentrated along arterial routes to the west and south of the city and also in Wolvercote, Marston and South Hinksey					
Area of BAP (km)	Approximately 1km^2 of floodplain BAP habitat (floodplain grazing marsh).					
Floodplain area	7km^2 of floodplain					
Watercourse length	32km of natural channel and 3km of maintained or modified channel					

Description of designated sites	The designated sites near Oxford are in the Upper Thames policy unit.		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**£300k**		
	Major Assets	**High risk systems**	**Medium & low risk systems**
Approx. Expenditure	£160k	£140k	£0
Where	4 locks and weirs (Godstow, Osney, Iffley, Sandford)		
Purpose of Maintenance	Maintain the current levels of conveyance through the city, particularly on the smaller watercourses (for example, the Seacourt Stream, Castle Mill Stream and Wolvercote Stream).		
Approximate Standards of service that apply	Approximately 300 properties are vulnerable to low order fluvial flooding (20% AEP) which has occurred three times since 2000.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	40%	
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood Protection Products Fair (Jul 08) Forecasting Improvements: No specific activity planned		
Opportunities & Constraints	**Redevelopment** to reduce risk through a layout or design that is more compatible with its location in a floodplain. For example the West End redevelopment. **Upstream attenuation or flood alleviation channels** to reduce the probability of flooding to the city. Any options to reduce flood risk should have no adverse impact on the internationally designated sites in Oxford (in the Upper Thames policy unit).		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The		

	impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P5: Take further action to reduce flood risk
Justification (Balancing Objectives)	The policy selection for Oxford recognises the level of risk at all return periods and the potential to reduce this risk in a sustainable way. Oxford has over 4000 properties at risk from flooding concentrated in one location. 200 of these properties can flood in a 20% AEP event. The MDSF modelling has over-estimated the number of properties that would flood in 10% and 4% events, but more detailed modelling does show that over 1000 properties would flood in a 4% flood event. The potential impacts of climate change in Oxford are greatest for the most frequent floods. The damages for the climate change scenario increase by 239% and 186% for the 10% AEP flood and 4% AEP flood respectively. The increased risk from climate change cannot be managed by continuing with the status-quo. Current levels of maintenance or even more maintenance will not mitigate these increased damages. Very large scale upstream storage in the Upper Thames (16m cubic metres) could reduce the number of properties at risk in the order of 36% and have benefits (albeit diminishing) further downstream in the Abingdon, Sandford to Cookham and Reading policy units. Upstream, the catchment is predominantly rural and the floodplain undeveloped. P6 has been selected for the upstream policy unit – the Upper Thames - to support the investigation of storage options. There is considerable uncertainty whether large scale storage would be feasible, but this option is being considered through the action plans (Ox1 – the Oxford strategy and UT1 – Making Space for Water in the Upper Thames). Other options (again with many economic, technical and environmental uncertainties) for Oxford include increasing conveyance by constructing a flood alleviation channel. Over the very long-term, the consequences of flooding could be reduced. Two of the actions (Short-term planning actions and long-term adaptation of the urban environment) are intended to maximise the opportunities to reduce the consequences of flooding through land use planning.
Key Actions (Developed in Action Plan)	**Ox1 – Oxford strategy** **Ox2 – Shorter-term land use planning actions** **Ox3 - Long-term adaptation of the urban environment to be more flood resilient** **Ox4 – Maintaining urban conveyance**
Risks, Uncertainties & Dependencies	There are a wide range of technical, environmental and economic uncertainties in bringing about a large scale and widespread reduction in the probability of flooding in Oxford (either through upstream flood storage or diversion channels). Alternatives focussed on reducing the consequences of flooding (with an emphasis on spatial planning, flood resilience and resistance) would be longer-term in there effect.
Regional Priority (0-5yrs)	Medium. Providing existing practices continue (maintenance continues to reduce the impacts of low order flood events (up to a 20% to 10% AEP), flood warning services are maintained and PPS25 is applied) the current risk in Oxford will not change significantly. If a scheme to reduce the probability of flooding does prove viable, it should be as viable in the future as it is now.

	Summary of the Preferred Approach					
Policy Unit	**Abingdon**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.6%**	of the economic consequences of fluvial flooding in Thames region				
	0.4%	of the social consequences of fluvial flooding in Thames region				
	0.1%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			1599		1942	
Properties (from MDSF)	1485	1608	1822	1909		
Total Damages (£m from MDSF)	33.86	44.80	65.55	73.58		7.35
Projected Damages (£m)						6.45
Residential Damages						4.90
Commercial Damages						2.45
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	1608	1767	1919	1965		
Climate Change (Damages)	45.10	56.95	77.03	81.90		8.53
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	123	159	97	56		
Damages: Actual	11.24	12.15	11.48	8.33		1.18
Properties: % Change	8.3%	9.9%	5.3%	2.9%		
Damages: % Change	33.2%	27.1%	17.5%	11.3%		16.0%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-1.89%	-5.53%	-5.76%	-3.09%		
Damages (%)	-17.83%	-13.55%	-19.30%	-6.75%		-16.33%
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						
Main clusters or features of the current flood risk	The majority of properties are at risk of flooding from the River Ock. There are no flood defences on the Ock and flooding can occur following very heavy rainfall over the catchment. Properties are also at risk along the River Stert, Larkhill Stream and Radley Park Ditch. These are relatively small, highly modified channels that flow through largely residential areas. Previous improvements (for example small scale flood storage on the Stert) reduce the probability of flooding (to approximately a 3% AEP standard of protection).					

Area of BAP (km)	None		
Floodplain area	1.5 km² of which 62% is urban		
Watercourse length	8km		
Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**£45k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure		45k	
Where		Abingdon	
Purpose of Maintenance	£45k on maintenance to reduce the probability of flooding from flow order flood events (up to a 10% to 5% AEP flood). Flooding in Abingdon on the minor tributaries (River Stert and Radley Park Ditch) can occur from point sources (for example blockages at pinch points). On the Ock the maintenance is aimed at maintaining the capacity of the natural channel in the absence of any major flood defences in Abingdon		
Approximate Standards of service that apply	5% to 2% AEP on the River Ock Approximately 3% to 1% AEP on the River Stert and Larkhill Stream		
Flood Warning (activities planned for 2008-09)	Proportion signed-up to FWD	25%	
	Detection Improvements: Site planned on River Stert Flood Awareness Events: No specific activity planned Forecasting improvements: No specific activity planned		
Opportunities & Constraints	Redevelopment of sites in Abingdon to reduce the consequences of flooding Potential major upstream storage. Either as a stand alone flood alleviation scheme or as part of engineering works associated with the Upper Thames Major Resources Development.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss.		

	P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P5: Take further action to reduce flood risk
Justification (Balancing Objectives)	Nearly 2000 properties in Abingdon are at risk of flooding from a 1% AEP flood. The MDSF modelling has over-estimated the number of properties and damages from more frequent floods (10% AEP) as the standard of protection for most of Abingdon is about 5% AEP (which is low to moderate by national standards). Flooding in Abingdon can occur very rapidly on the River Stert and Larkhill Stream and quite rapidly from the River Ock. There may be an opportunity to reduce the probability of flooding in Abingdon through upstream attenuation in the Ock policy unit. There are no raised defences in the upstream Ock catchment and therefore little scope to reduce risk in Abingdon through more attenuation in the natural floodplain. To significantly reduce the flood risk in Abingdon would require engineered flood storage and / or flood bunds along the River Ock. Implementation of the policy through attenuation is therefore uncertain and will need to be investigated (action Ab4). The capital costs for such a project are likely to be over £2m, but less than £10m. The damages and number of properties at risk justify further investigation recognising all of the uncertainties.
Key Actions (Developed in Action Plan)	**Ab1 - Land use planning** **Ab2 - Maintain the current standard of protection through maintenance** **Ab3 - Flood warning, flood awareness and emergency planning** **Ab4 - Investigate opportunities to reduce flood risk including the impact of storage on the Ock** **Ab5 - Flood proofing and flood resilience**
Risks, Uncertainties & Dependencies	Achieving the selected policy is very uncertain at this stage. The key issues are • Upstream Storage: Dependent upon resolving technical, environmental and financial constraints. The first question is to determine whether storage would be effective. • Resilience: dependent upon progress in implementing Making Space for water and the outcomes from the associated pilot studies. If engineering options are not viable then the policy will need to be reviewed, but the approach will be dependent (in the very long-run) on the character of redevelopment in the Abingdon floodplain.
Regional Priority (0-5yrs)	Medium. It is important to investigate whether P5 is achievable in this policy unit to inform future decision making.

	Summary of the Preferred Approach			
Policy Unit	**Ock**			
	What is currently at risk from flooding: Problem / Risk			
Regional Context	**0.2%**	of the economic consequences of fluvial flooding in Thames region		
	0.1%	of the social consequences of fluvial flooding in Thames region		
	0.9%	of the floodplain, channel and designated environmental assets in Thames region		
	Current Risk			
	20% AEP	**5% AEP**	**1% AEP**	**0.1% AEP**
Properties (from flood zones)			450	540

Properties (from detailed modelling)				
Main clusters or features of the current flood risk	Most of the properties at risk from flooding are located in Wantage, Grove and East Hanney.			
Area of BAP (km)	4km² mainly floodplain grazing marsh			
Floodplain area	22km^2 of which only 4% is urban.			
Watercourse length	108km of channel of which only 0.3km is artificial or modified			
Description of designated sites	Cothill Fen SAC (not water-dependant) and Hackpen Hill SAC (not in the floodplain)			
	Current responses to flood risk within the policy unit			
Total Maintenance Expenditure	**Approx 41k**			
	Major Assets	**High Risk Systems**	**Low & medium Risk**	
Approx. Expenditure	0	34	7	
Where		Wantage, Grove, Steventon		
Purpose of Maintenance	Maintaining channel capacity in Wantage, Grove and Steventon.			
Approximate Standards of service that apply	Within the villages the standard of protection is typically 10% to 5% AEP. Locally this is less, particularly where there are restrictions to flow associated with mills and other structures.			
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	25%		
	No specific activities planned			
Opportunities & Constraints	A major reservoir (the Upper Thames Major Resource Development - UTMRD) may be constructed in the Ock policy unit in the next 20 years. This development would involve very large scale earthworks and may therefore represent an opportunity to create some flood storage on the Ock to benefit the more vulnerable downstream Abingdon policy unit. This potential option has not yet been investigated. Maintaining or enhancing floodplain capacity to store water to provide direct environmental benefit and small, localised economic and social benefits. Small to moderate scale redevelopment of villages provides an opportunity to gradually reduce the consequences of flooding.			
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral.			

	P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).
Justification (Balancing Objectives)	P6 has been selected for the Ock policy unit to recognise the potential (albeit uncertain at this stage) to reduce the risk to the Abingdon policy unit further downstream. An increase in the area of BAP is indicated under this policy. This is because under this policy the floodplain will be safeguarded and the potential to expand or enhance habitat will be increased. The soil types and geology in the Ock catchment offer some potential to create new wetland BAP habitats. Within the Ock policy unit over 99% of the watercourses are classified as natural (as opposed to maintained or artificially modified). In reality there have been some modifications to some of the watercourses as part of previous land drainage schemes. We would be looking to restore these rivers as opportunities arose.
Key Actions (Developed in Action Plan)	**Oc1 Land use planning** **Oc2 Conveyance in urban locations** **Oc3Effectiveness of maintenance** **Oc4 Flood warning, flood awareness and emergency planning** **Oc5 Investigate the impact of storage in the Ock in reducing flood risk downstream** **Oc6 Flood proofing and flood resilience to existing properties**
Risks, Uncertainties & Dependencies	Viability of flood storage to reduce flood risk to the downstream Abingdon policy unit.
Regional Priority (0-5yrs)	Low overall, apart from actions to determine the potential benefits of flood storage in this policy unit.

	Summary of the Preferred Approach	
Policy Unit	**Sandford to Cookham**	
	What is currently at risk from flooding: Problem / Risk	
Regional Context	**2.5%**	of the economic consequences of fluvial flooding in Thames region
	2.0%	of the social consequences of fluvial flooding in Thames region
	5.3%	of the floodplain, channel and designated environmental assets in Thames region

	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			5446		7793	
Properties (from MDSF)	2390	3109	5158	6479		
Total Damages (£m from MDSF)	48.28	70.65	174.05	302.45		13.14
Projected Damages (£m)						13.88
Residential Damages						8.37
Commercial Damages						4.78
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	3245	4763	6736	6980		
Climate Change (Damages)	74.04	135.90	334.15	380.35		17.35
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	855	1654	1578	501		
Damages: Actual	25.76	65.25	160.10	77.90		4.21
Properties: % Change	35.8%	53.2%	30.6%	7.7%		
Damages: % Change	53.4%	92.3%	92.0%	25.8%		32.0%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-12.85%	-16.40%	-24.39%	-18.92%		
Damages (%)	-20.88%	-21.67%	-43.01%	-40.08%		-28.02%
	Impact of Scenario's on 1% AEP					
	16m cubic metres of upstream storage	100% storage on the Cherwell	100% storage on the Thame	100% storage on the Loddon		
Properties: Actual	4304	3809				
Damages: Actual	119.32					
Properties: % Baseline change	-22.6%	-26.2%	-27.2%	-6.6%		
Damages: % Baseline change	-34.3%	-39.6%	-43.8%	-11.5%		
Main clusters or features of the current flood risk	Pangbourne, Dorchester, Purley on Thames, Shiplake, Henley, Marlow					
Area of BAP (km)	10.5km^2 of floodplain BAP habitat					

Floodplain area			
Watercourse length	214km of natural channel 10km of bank protection		
Description of designated sites	Little Wittenham SAC, Chilterns Beechwoods SAC, Hartslock Wood SAC (none of which are water-dependant)		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**£1160k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	930	150	80
Where	Thames locks and weirs		
Purpose of Maintenance	The vast majority of maintenance expenditure in this policy unit (approximately £930k per annum) is spent on maintaining the Thames locks and weirs.		
Approximate Standards of service that apply	Typically, 50% to 20% AEP on the natural floodplain and 10% to 2% AEP in urban locations.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	15%	
	Detection Improvements: No specific activity planned Flood Awareness Events: Planning for museum exhibition in 09-10 (Henley) Forecasting Improvements: No specific activity planned		
Opportunities & Constraints	For now and the foreseeable future, Statutory water levels will be maintained for navigation purposes. There is therefore an on-going need to maintain weirs on the River Thames. There are opportunities to enhance or expand floodplain BAP habitat in the extensive Thames floodplain. The physical characteristics of the policy unit, with a wide floodplain underlain by gravel mean that there are no simple solutions to reduce the probability of flooding; flood embankments and walls tend to be ineffective.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable.		

	P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	5500 properties are at risk from a 1% AEP flood and Annual Average Damages are in the order of £13m (Our judgement is that MDSF has slightly over-estimated the level of damages). The risks in this policy unit are high and appear quite sensitive to the potential impacts of climate change with damages increasing by between 50% and 90% across all return periods. Flooding in this policy unit occurs after prolonged rainfall, levels rise gradually so there is adequate time to issue flood warnings and the flooding tends to be widespread rather than deep (there are some areas more susceptible to deeper flooding). The risks to life are relatively low therefore, but the impact on people in terms of disruption and displacement and economic losses are large and will increase with climate change. Standards of protection to urban areas in this policy unit are low by national standards (typically 10% to 2% AEP). The high level of risk, the disproportionate impacts of climate change and the relatively low standards of protection justify a policy of mitigating against the impacts of climate change (P4). Implementation of this policy will be difficult as there are a number of constraints. The first is that the physical characteristics of the policy unit, with a wide floodplain underlain by gravel mean that there are no simple solutions to reduce the probability of flooding; flood embankments and walls tend to be ineffective. There are potential solutions in some places, but they tend to be quite complex and therefore expensive. We have an action to identify and safeguard any possible options. They will generally not be a priority for funding in the next five years. The second is the relatively low level of redevelopment in the policy unit as the Thames riverside towns tend to be established and historic. We therefore have an action to bring about gradual and long-term adaptation of urban locations and increase the resilience of existing buildings and infrastructure. Attenuation upstream could reduce the probability of flooding in this policy unit. 16m cubic metres of storage would reduce damages in the order of 32% for example. Upstream attenuation within the Upper Thames is being investigated as part of the Oxford strategy. We have included an action for the Reading policy unit to further investigate the potential impact of storage in the Thame catchment. There are considerable technical, environmental and economic uncertainties associated with all of these options. Within this policy unit we have an action to safeguard the existing natural floodplain so that it can continue to function.

	The implementation of P4 in the Sandford to Cookham policy unit is an "average" outcome. There will be more frequent flooding of the natural floodplain, which will have a benefit for BAP habitat. There may be flood defences in some of the flooding hotspots, along with longer-term adaptation of all urban centres. The conclusion of the Oxford strategy will influence the management of the probability of flooding along the Thames. At this stage the most effective use of resources will be to seek to manage the long-term consequences of flooding. This policy will need to be reviewed in the next five years.
Key Actions (Developed in Action Plan)	**SC1 - Land use planning in the short- to medium-term** **SC2 - Long-term adaptation of the urban environment to be more flood resilient** **SC3 - Flood warning, flood awareness and emergency planning** **SC4 - Safeguard future opportunities to reduce the probability of flooding in the future** **SC5 - Flood proofing and flood resilience to existing properties**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the evolution, growth and redevelopment of the river corridor in the main towns at risk. Dependent on the outcome from the Oxford strategy. Upstream storage is a possible outcome from this strategy. Such an outcome would contribute to risk reduction in this policy unit.
Regional Priority (0-5yrs)	Medium. The right intervention through the planning system now will reduce the long-term consequences of flooding. A recommendation has been made to progress the Middle Thames strategy once the direction of the Oxford strategy is clear. The Middle Thames strategy will consider locations close to Reading.

	Summary of the Preferred Approach					
Policy Unit	**Thame**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.5%**	of the economic consequences of fluvial flooding in Thames region				
	0.3%	of the social consequences of fluvial flooding in Thames region				
	3.2%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			1321		2150	
Properties (from MDSF)	70	80	109	133		
Total Damages (£m from MDSF)	1.90	2.23	3.95	6.02		0.32
Projected Damages (£m)						0.61
Residential Damages						0.08
Commercial Damages						0.24

	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	79	103	155	185		
Climate Change (Damages)	2.26	2.99	7.52	11.19		0.40
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	9	23	46	52		
Damages: Actual	0.36	0.76	3.57	5.18		0.08
Properties: % Change	12.9%	28.8%	42.2%	39.1%		
Damages: % Change	18.7%	34.3%	90.4%	86.0%		24.7%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	0.00%	-5.00%	-8.26%	-16.54%		
Damages (%)	-7.08%	-9.04%	-30.56%	-33.79%		-19.03%
	Impact of Scenario's on 1% AEP					
	Urbanisation					
Properties: Actual	111					
Damages: Actual	3.98					
Properties: % Baseline change	-1.8%					
Damages: % Baseline change	0.9%					

Main clusters or features of the current flood risk	Headwaters of the Thame tributaries e.g. Chalgrove Brook, Wendover Brook and Castle Park Stream		
Area of BAP (km)	1km^2 of BAP habitat comprising reedbed and fen.		
Floodplain area	55km² of which 96% is rural		
Watercourse length	335km of natural channel 1km of modified channel		
Description of designated sites	Aston Rowant SAC, Chilterns Beechwood SAC (neither are within the floodplain)		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 100k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	0	39	61
Where		Mainly in the Chalgrove and Wendover areas	
Purpose of	To maintain conveyance through small towns and villages: Chalgrove, Aston		

Maintenance	Turville and Wendover	
Approximate Standards of service that apply	The Thame is a relatively flat, clay catchment. The River Thame spills out of banks frequently in the winter after heavy rainfall. Through the towns and small villages maintenance and previous channel improvements result in a 10% to 4% AEP being typical.	
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	7%
	No specific activities planned	
Opportunities & Constraints	Opportunities in the Thame policy unit are limited. Over 99% of the watercourses flow within a natural earth channel. There is a small area of BAP and the potential to expand this area is more significant in other parts of the region.	
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.	
Policy	P3. Continue with existing or alternative actions to manage flood risk at the current level.	
Justification (Balancing Objectives)	In the context of Thames region, there is comparatively little risk in the Thame policy unit (0.5% of the economic consequences of flooding in Thames region). However there are over 1000 properties at risk of flooding and the management of the risk to these properties is almost entirely dependent upon existing watercourse maintenance and flood awareness. The maintenance is focused on the small towns and villages – most systems in the policy unit do not have any maintenance activity.	
Key Actions (Developed in Action Plan)	**Th1 Land use planning** **Th2 Conveyance in urban locations** **Th3 Flood warning, flood awareness and emergency planning**	
Risks, Uncertainties &	There are no regionally significant dependencies in the Thame policy unit.	

Dependencies	
Regional Priority (0-5yrs)	Low. Recognising the relatively moderate flood risk and lack of sustainable opportunities to significantly reduce the probability of flooding.

	Summary of the Preferred Approach					
Policy Unit	**Aylesbury**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.9%**	of the economic consequences of fluvial flooding in Thames region				
	0.5%	of the social consequences of fluvial flooding in Thames region				
	0.3%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			1926		2581	
Properties (from MDSF)	1249	1563	2019	2311		
Total Damages (£m from MDSF)	36.89	42.22	52.76	59.01		6.21
Projected Damages (£m)						6.21
Residential Damages						2.01
Commercial Damages						4.21
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	1563	1857	2479	2716		
Climate Change (Damages)	42.18	49.34	63.81	73.50		6.78
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	314	294	460	405		
Damages: Actual	5.29	7.12	11.05	14.49		0.57
Properties: % Change	25.1%	18.8%	22.8%	17.5%		
Damages: % Change	14.3%	16.9%	20.9%	24.6%		9.1%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-11.53%	-11.32%	-11.74%	-11.42%		
Damages (%)	-6.97%	-7.31%	-10.51%	-10.05%		-8.82%
	Impact of Scenario's on 1% AEP					
	Urbanisation					
Properties: Actual	2047					
Damages: Actual	53.08					

Properties: % Baseline change	-1.4%					
Damages: % Baseline change	0.6%					
Main clusters or features of the current flood risk	Aylesbury town centre and also along Stoke Brook and Southcourt brook to the south-west of the town					
Area of BAP (km)	None					
Floodplain area	5km² of which almost 30% is urban					
Watercourse length	46km of natural channel of which approximately 8km is modified					
Description of designated sites	None					
	Current responses to flood risk within the policy unit					
Total Maintenance Expenditure	**Approx 236k**					
	Major Assets		**High Risk Systems**		**Low & medium Risk**	
Approx. Expenditure	71		165		0	
Where	Aylesbury FSA					
Purpose of Maintenance	To maintain the Aylesbury FSA and the conveyance of the channels through the town					
Approximate Standards of service that apply	1% AEP					
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD			<1%		
	No specific activities planned					
Opportunities & Constraints	Redevelopment of the river corridor through Aylesbury.					
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators as the condition of modified watercourses deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration of modified watercourses. Reductions in Development Control activity in this policy unit could also lead to an increase in inappropriate development in the floodplain as there is a lot of growth planned. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts					

	of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience, removing restrictions to flow or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from new defences. P6: Attenuation can reduce the risk to some people and property within the policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	A large proportion of the properties at risk in Aylesbury are protected to a 1% AEP standard. The main defence is provided by a flood storage area upstream and complementary channel improvements through the town. Up to 1200 properties would be at risk from frequent flooding (10% AEP) without these defences. The policy and approaches that will be implemented as a consequence have been selected because; • The opportunities to reduce our dependency on the current defences, make the urban environment more resilient to flooding and restore urban watercourses will be maximised. This will lead to our objective to work towards a more sustainable blend of activity to manage the flood risk being met. • The massive Greenfield development around Aylesbury will not increase flood risk. • There is a large residual flood risk in Aylesbury (2000 properties). We do not anticipate any actions to further reduce the probability of flooding in the foreseeable future. We do expect to reduce the consequences of flooding to offset the impacts of climate change. This is because of the level of redevelopment in Aylesbury, which provides sufficient opportunity to increase the resilience of the urban environment. The risk in this policy unit could either decrease or increase – depending how successful we are in implementing policy. Greenfield development in and around Aylesbury could increase the economic and social consequences of flooding (by bringing more people and property into the floodplain and increasing run-off). Redevelopment through the town could have positive or negative impacts on flood risk. To manage the social and economic consequences, approaches that are most effective at reducing the impacts of flooding through spatial planning (application of the Sequential test, a focus on the location, layout and design of the redevelopment along the river corridor through Aylesbury) and maintaining the existing defences are most effective. There is no BAP habitat in Aylesbury and little potential to introduce BAP. However, our approach to the redevelopment of the river corridor through the town provides real opportunities for river restoration and the improvement of morphology. Reducing the social and economic consequences will be the primary driver, but the approach is complementary to environmental

	improvement that can realistically be achieved under the selected P4 policy. The actions focus on taking these approaches to manage the consequences of flooding forward.
Key Actions (Developed in Action Plan)	**Ay1 Land use planning - Location of new development and the management of run-off** **Ay2 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **Ay3 Maintain existing defences**
Risks, Uncertainties & Dependencies	Dependent upon; • reaching agreement at a strategic level on the vision for the redevelopment of the river corridor • the appropriate location of new development
Regional Priority (0-5yrs)	High. The right intervention through the planning system now will reduce our dependency on existing flood defences and the associated long-term maintenance and replacement costs.

	Summary of the Preferred Approach					
Policy Unit	**Kennet**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**2%**	of the economic consequences of fluvial flooding in Thames region				
	0.9%	of the social consequences of fluvial flooding in Thames region				
	15%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			3338		3970	
Properties (from MDSF)	1786	2130	2615	3131		
Total Damages (£m from MDSF)	46.00	58.89	102.80	121.29		10.65
Projected Damages (£m)						12.95
Residential Damages						3.43
Commercial Damages						7.22
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	2180	2546	3363	3555		
Climate Change (Damages)	60.48	91.77	140.81	166.95		12.55
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	394	416	748	424		
Damages: Actual	14.47	32.88	38.01	45.66		1.91
Properties: %	22.1%	19.5%	28.6%	13.5%		

Change						
Damages: % Change	31.5%	55.8%	37.0%	37.6%		17.9%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-6.49%	-12.58%	-6.62%	-15.97%		
Damages (%)	-11.43%	-15.70%	-21.85%	-13.70%		-14.01%
	Impact of Scenario's on 1% AEP					
	Urbanisation					
Properties: Actual	2647					
Damages: Actual	106.69					
Properties: % Baseline change	1.2%					
Damages: % Baseline change	3.8%					
Main clusters or features of the current flood risk	People and property at risk of flooding is widely dispersed, with some clusters of property at risk mainly in Newbury, Theale, Marlborough and Hungerford.					
Area of BAP (km)	Approximately 7km^2 of floodplain BAP habitat (predominantly floodplain grazing marsh with areas of fen, wet woodland and reedbed).					
Floodplain area	60km^2 of floodplain (91% undeveloped and 9% urban)					
Watercourse length	330km of natural channel and 7km of maintained or modified channel.					
Description of designated sites	Within the Kennet catchment are two water-dependent internationally designated sites; Kennet and Lambourn Floodplain SAC and Kennet Valley Alderwoods SAC .					
	Current responses to flood risk within the policy unit					
Total Maintenance Expenditure	**Approx 311k**					
	Major Assets		**High Risk Systems**		**Low & medium Risk**	
Approx. Expenditure	2		178		131	
Where						
Purpose of Maintenance	Maintain conveyance in urban areas and the control of water levels, particularly at designated sites.					
Approximate Standards of service that apply	10% AEP is typical. Slightly higher standard (5% AEP) in the larger urban areas such as Newbury.					
Flood Warning	Proportion signed-up to FWD			15%		

(activities planned in 2008-09)	Detection Improvements: No specific activity planned Flood Awareness Events: No specific activity planned Forecasting Improvements: Hydrodynamic model to be delivered Routing models to be delivered
Opportunities & Constraints	Maintaining or enhancing floodplain capacity to store water to provide direct environmental benefit and small, localised economic and social benefits. Expansion and enhancement of existing floodplain BAP habitat. Very long-term reduction in the consequences of flooding. There are possible opportunities to reduce the flood risk to parts of Newbury by improving conveyance and local protection. Local defences should not be progressed where areas are likely to be redeveloped in the foreseeable future as this may preclude longer-term, more sustainable options to manage the risk through redevelopment (for example through resilience) and conflict with the objective of re-establishing river corridors.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).
Justification (Balancing Objectives)	The strategic direction for flood risk management in the Kennet policy unit is much more about specific actions in specific locations than overall policy. The hydrological and environmental constraints do mean that this catchment will not really be managed as a whole, but more in parts. The selected policy is; • Intended to maintain or enhance the condition of the two internationally

	designated sites. • Intended to safeguard the natural floodplain. The capacity of this floodplain reduces flood risk within the policy unit and downstream. Safeguarding the floodplain increases the potential to enhance or expand floodplain BAP habitat. **Internationally designated sites** Within the Kennet catchment are two water-dependent internationally designated sites; Kennet and Lambourn floodplain and Kennet Valley Alderwoods. Kennet and Lambourn Floodplain SAC consists of four SSSIs including Thatcham Reedbeds, which is one of the largest inland reedbeds in southern England, containing 3.3% of this type of habitat. The SAC is one of the best areas in the UK for Desmoulin's whorl snail (a British Red Data Book species). The flora of the River Kennet is species-rich and diverse, it has the highest average number of species per site surveyed of any other lowland river in Britain. The principal water level objectives are to maintain the perennial flow of the Kennet with natural flow variations. For the Chiltern Foliat SSSI, an increase in the length of flooding on the water meadows is desired. Kennet Valley Alderwoods SAC are considered to be one of the best areas in the UK for alder woodland on floodplain, which is now rare throughout Europe. The water level objectives for the site are to maintain the current hydrological conditions resulting from variation in the water levels (from surface flooded to relatively dry) and to maintain the level of flooding during winter. To maintain and enhance these sites, a policy that results in at least as much inundation of these sites as presently occurs has been selected. The policy provides the basis to increase this frequency where it may needed (subject to any subsequent technical evaluation). The potential (at a technical level) to enhance and expand the existing habitat is very high in the Kennet. The existing habitat is significant at a regional scale, there is potential for improvement and this would be compatible with our aim of maintaining or enhancing the capacity of the natural floodplain to store water. The Kennet floodplain is one of the areas with the highest potential for wetland BAP creation across Thames region, due to current soil type, geology and environmental conditions. There is also a fairly high potential for both land use and land management change. There are benefits to progressing options to manage the risk to major areas of risk in the policy unit (Newbury, Hungerford, Marlborough and Theale) through a combination of land use planning and local defences. Potential schemes do have economic uncertainties, but are worthy of more detailed investigation. In the action plan, recognising these uncertainties, we are looking to safeguard areas where there are opportunities to reduce risk through defences. Compensatory storage would ensure no net loss of floodplain and compatibility with the selected policy.
Key Actions (Developed in Action Plan)	**Ke1 Maintaining and improving designated sites** **Ke2 Efficient and effective targeting of maintenance** **Ke3 Flood warning, flood awareness and emergency planning** **Ke4 Land use planning** **Ke5 Long-term adaptation of the urban environment to be more flood resilient in Newbury** **Ke6 Safeguard future opportunities to reduce the probability of flooding in the future** **Ke7 Surface Water Management Plan**

Risks, Uncertainties & Dependencies	The major risk in this policy unit is from potential development within the floodplain upstream of Reading. This development will be resisted. It is not compliant with PPS25 or the objectives within this policy unit. P4, P5 and P6 can all complimentary policies (short, medium and long-term approaches), P4 is dependent upon reaching a strategic vision with key local authorities on what can be achieved through redevelopment, P5 is largely dependent upon the criteria for future investment and P6 will be dependent upon both and the overall progress in applying Making Space for Water.
Regional Priority (0-5yrs)	Low overall. Some can be achieved through an evolution of approach and the priority recognises that the rate of change will be moderate.

	Summary of the Preferred Approach					
Policy Unit	**Reading**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**3.8%**	of the economic consequences of fluvial flooding in Thames region				
	1.7%	of the social consequences of fluvial flooding in Thames region				
	0.3%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			6867		7351	
Properties (from MDSF)	2759	3688	4894	5116		
Total Damages (£m from MDSF)	31.04	70.17	235.96	345.59		13.14
Projected Damages (£m)						18.43
Residential Damages						5.15
Commercial Damages						7.98
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	3941	4799	5269	5491		
Climate Change (Damages)	80.85	200.60	424.83	516.77		19.41
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	1182	1111	375	375		
Damages: Actual	49.82	130.43	188.88	171.18		6.28
Properties: % Change	42.8%	30.1%	7.7%	7.3%		
Damages: % Change	160.5%	185.9%	80.0%	49.5%		47.8%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**

Properties (%)	-34.58%	-11.69%	-9.13%	-4.20%		
Damages (%)	-29.30%	-45.57%	-36.61%	-30.64%		-34.49%
	Impact of Scenario's on 1% AEP					
	16m cubic metres of upstream storage	100% storage on the Cherwell	100% storage on the Thame	100% storage on the Kennet		
Properties: Actual	4569	4478	4126	4369		
Damages: Actual	143.0	134.4	91.9	192.2		
Properties: % Baseline change	6.6%	8.5%	15.7%	10.7%		
Damages: % Baseline change	39.4%	42.8%	61.0%	18.5%		

Main clusters or features of the current flood risk	North of Reading town centre (from the River Thames) of which the most vulnerable properties are in Caversham. Some properties at risk south of the town centre (from the River Kennet).		
Area of BAP (km)	0.11 km² of floodplain grazing marsh		
Floodplain area	7.2km^2 of floodplain. Over 50% of the floodplain is urban		
Watercourse length	31km.		
Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**£110k**		
	Major Assets	**High risk systems**	**Medium and low risk systems**
Approx. Expenditure	£51k	£59k	£0
Where	Thames locks and weirs		
Purpose of Maintenance	To maintain conveyance, particularly on the Kennet and Foudry Brook through Reading.		
Approximate Standards of service that apply	Typically 20% to 5% AEP on both the Thames and Kennet. Low lying properties, particularly in Caversham are vulnerable to frequent flooding. Along the Kennet through Reading redevelopment has improved the standard of protection to 1% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	30%	
	No specific activities planned		

Opportunities & Constraints	There is considerable development pressure in Reading. Where this results in redevelopment there is an opportunity to reduce risk through a layout or design that is more compatible with its location in a floodplain. The development pressure in Reading also poses major risks with pressures on existing floodplains immediately upstream of Reading on the Kennet.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P5: Take further action to reduce flood risk
Justification (Balancing Objectives)	The policy selection for Reading recognises the level of risk at all return periods. Reading has over 6000 properties at risk from flooding concentrated in one location. The potential impacts of climate change in Reading are greatest for the most frequent floods. The damages for the climate change scenario increase by 160% and 185% for the 10% AEP flood and 4% AEP flood respectively. Implementation of the policy for Reading is problematic and does need further investigation. Very large scale upstream storage in the Upper Thames (16m cubic metres) could reduce the number of properties at risk in a 1% AEP event by 6% and damages by 39%. However, under the climate change scenario for a 1% event, the number of properties at risk increase by 7% and damages increase by 80%. At best therefore, upstream storage on the Thames (which is uncertain) may offset the impacts of climate change. Upstream attenuation would need to be closer to Reading to significantly reduce the probability of flooding. Modelling results indicate that attenuation in the Thame catchment could reduce risk in Reading. We are sceptical about the scale of impact indicated by the modelling, but the result is worthy of more detailed investigation.

	Action Rd1, a strategy for the Middle Thames is designed to investigate these and other options more closely. The level of flood risk (number of properties at risk and the level of flood damages) in Reading justifies the policy and these investigations, but our early view is that reducing the probability of flooding in Reading in a sustainable way will be very challenging. Over the very long-term, the consequences of flooding could be reduced. Two of the actions (Rd2 and Rd3, Short-term planning actions and long-term adaptation of the urban environment) are intended to maximise the opportunities to reduce the consequences of flooding through land use planning.
Key Actions (Developed in Action Plan)	**Rd1 - Middle Thames flood risk management strategy** **Rd2 - Shorter-term land use planning actions** **Rd3 - Long-term adaptation of the urban environment to be more flood resilient** **Rd4 Flood warning, flood awareness and emergency planning**
Risks, Uncertainties & Dependencies	There are a wide range of technical, environmental and economic uncertainties in bringing about a large scale and widespread reduction in the probability of flooding in Reading (either through upstream flood storage or diversion channels). Alternatives focussed on reducing the consequences of flooding (with an emphasis on spatial planning, flood resilience and resistance) would be longer-term in there impact and dependent upon a wider implementation of Making Space for Water (particularly flood resilience).
Regional Priority (0-5yrs)	Medium. Providing existing practices continue (maintenance continues to reduce the impacts of low order flood events (up to a 20% to 10% AEP), flood warning services are maintained and PPS25 is applied) the current risk in Reading will not change significantly in the short term. If a scheme to reduce the probability of flooding does prove viable, it should be as viable in the future as it is now.

	Summary of the Preferred Approach					
Policy Unit	**Loddon**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.6%**	of the economic consequences of fluvial flooding in Thames region				
	0.2%	of the social consequences of fluvial flooding in Thames region				
	3.6%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			971		2106	
Properties (from MDSF)	321	337	449	514		
Total Damages (£m from MDSF)	9.97	11.59	14.32	16.52		2.12
Projected Damages (£m)						3.26
Residential Damages						0.48
Commercial Damages						1.64

	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	340	374	576	679		
Climate Change (Damages)	11.75	13.42	18.27	21.67		2.33
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	19	37	127	165		
Damages: Actual	1.78	1.83	3.95	5.14		0.21
Properties: % Change	5.9%	11.0%	28.3%	32.1%		
Damages: % Change	17.8%	15.8%	27.6%	31.1%		9.8%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-5.92%	-3.56%	-17.82%	-12.65%		
Damages (%)	-10.90%	-9.04%	-11.31%	-13.17%		-10.53%
	Impact of Scenario's on 1% AEP					
	Urbanisation					
Properties: Actual	439					
Damages: Actual	14.28					
Properties: % Baseline change	2.2%					
Damages: % Baseline change	0.2%					
Main clusters or features of the current flood risk	Winnersh, Fleet Brook, River Hart					
Area of BAP (km)	Approximately 4.1km^2 of floodplain BAP habitat (predominantly floodplain grazing marsh with areas of fen, wet woodland and reedbed).					
Floodplain area	42km^2 of floodplain (91% undeveloped and 9% urban)					
Watercourse length	254km of natural channel and 5km of maintained or modified channel or culverts.					
Description of designated sites	Thames Basin Heaths SPA (non water-dependant)					
	Current responses to flood risk within the policy unit					
Total Maintenance Expenditure	**Approx 299k**					
	Major Assets		**High Risk Systems**		**Low & medium Risk**	
Approx. Expenditure	0		223		76	
Where						

Purpose of Maintenance	Maintain the capacity of the river channel in urban areas.	
Approximate Standards of service that apply	50% AEP for much of the natural floodplain, 10% to 4% AEP in urban locations.	
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	22%
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood information days (Mar 09) Forecasting Improvements: No specific activity planned	
Opportunities & Constraints	Maintaining or enhancing floodplain capacity to store water to provide direct environmental benefit and small, localised economic and social benefits. Very long-term reduction in the consequences of flooding, particularly in the Lower Loddon towns. The current land use within this policy unit does allow the possibility of widespread flood storage to reduce flood risk to people and property. Broad scale modelling indicates that reducing peak flows by storing approximately 10% of a typical 1% AEP flood would reduce damages within the policy unit in the order of 15%. The impact on downstream policy units would depend very much on the pattern of rainfall. There is the potential to reduce flood damages (Thames Sandford to Cookham and the Lower Thames) in the order of 1% to 2%. However, in some events the peak from the Loddon will have passed before flooding on the Thames occurs.	
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions. .	

Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).
Justification (Balancing Objectives)	The policy has been selected for the Loddon because it offers the most potential to; • Enhance and expand floodplain BAP habitat • Reduce flood risk to people and property downstream • Reduce flood risk to some people and property within the policy unit The actions are designed to take some of the initial steps in meeting these objectives. The selected policy sets a direction for this policy unit to try and maintain and maximise the key opportunities associated with the extensive natural floodplain. The priority recognises that in the context of Thames region, the existing flood risk to people and property is moderate. The Loddon floodplain is one of the areas with the highest potential for wetland BAP creation across Thames region, due to current soil type, geology and environmental conditions. There is currently over 4km² of wetland BAP habitat in the Loddon, mainly floodplain grazing marsh. It is beneficial to create new habitat close to existing sites therefore the Loddon catchment is ideal for creating new BAP habitat whilst also providing flood risk benefits. There is also some potential for both land use and land management change
Key Actions (Developed in Action Plan)	**Lo1 Making Space for Water** **Lo2 Efficient and effective targeting of maintenance** **Lo3 Flood warning, flood awareness and emergency planning** **Lo4 Land use planning** **Lo5 Safeguard future opportunities to reduce the probability of flooding in the future**
Risks, Uncertainties & Dependencies	There are no regionally significant risks in the Loddon policy unit as a whole.
Regional Priority (0-5yrs)	Low overall. Opportunities e.g. through LDF reviews and Strategic Flood Risk Assessments that lead to long-term changes in the character of the urban areas at risk from flooding in the Lower Loddon need to be pursued.

	Summary of the Preferred Approach				
Policy Unit	**Basingstoke**				
	What is currently at risk from flooding: Problem / Risk				
Regional Context	**0.3%**	of the economic consequences of fluvial flooding in Thames region			
	0.2%	of the social consequences of fluvial flooding in Thames region			
	0.1%	of the floodplain, channel and designated environmental assets in Thames region			
	Current Risk				
	20% AEP		**5% AEP**	**1% AEP**	**0.1% AEP**
Properties (from flood zones)				820	1080
Properties (from detailed modelling)					

Main clusters or features of the current flood risk	Basingstoke town centre (River Loddon) and also some properties at risk in Chineham to the north-east of the town (Petty's Brook)		
Area of BAP (km)	Very small area of wet woodland		
Floodplain area	1.2 km² of which 40% is urban		
Watercourse length	6 km of which approximately 0.5 km is highly modified		
Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 11k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	0	11	0
Where		Basingstoke	
Purpose of Maintenance	Maintaining channel conveyance through Basingstoke through the removal of debris at pinch points.		
Approximate Standards of service that apply	4% to 2% AEP		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	4%	
	No specific activities planned		
Opportunities & Constraints	Redevelopment of the river corridor through Basingstoke to; • Reduce the consequences of flooding • Opening up culverts where possible and river restoration • Making the river a feature of the town • Reducing long-term maintenance costs		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators as the condition of modified watercourses deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration of modified watercourses. Reductions in Development Control activity in this policy unit could also lead to an increase in inappropriate development in the floodplain as there is a lot of growth planned. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience, removing restrictions to flow or large scale redevelopment is needed to attain this policy.		

	P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from new defences. P6: Attenuation can reduce the risk to some people and property within the policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	There are just over 800 properties at risk in Basingstoke and most have a moderate standard of protection. We do not anticipate any large scale measures to reduce the probability of flooding, but do anticipate a gradual reduction in the consequence of flooding as parts of the town are redeveloped. In Basingstoke there is very large housing growth planned with the potential to increase the number of properties at risk and increase flood risk locally. There is also redevelopment happening along the river corridor through the town and in areas subject to, and contributing to, surface water flooding. The policy is aimed at achieving the right level of intervention to prevent inappropriate new development (with a focus on location) to (a) reduce risk by increasing the resilience of buildings in the floodplain (b) reduce future asset replacement costs by removing artificial structures and culverts. (c) naturalise the watercourse where practicable (d) reduce surface water run-off through redevelopment With this focus, P4 his is achievable and realistic within current resources. Providing the new development in and around Basingstoke takes account of flood risk as defined in PPS25 there will not be a change in any of the indicators that would impact at a regional scale. A small increase in environmental assets is likely. Gains against social and economic indicators under the proposed approach rely on redevelopment through the town centre being resilient and having a different site layout. To achieve this will require extra intervention (under P4), but it is unlikely that a very large increase in intervention (as under a P5 policy) will lead to further gains providing the SFRA process is working well, LDF policies take full account of flood risk and the policies are being implemented. A further potential benefit of P4 under the proposed approach is that if implemented it will reduce the long-term legacy cost of maintenance and capital replacement.
Key Actions (Developed in Action Plan)	**Ba1 Land use planning - Location of new development and the management of run-off** **Ba2 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **Ba3 Surface water drainage** **Ba4 Maintaining conveyance**
Risks, Uncertainties & Dependencies	Dependent upon; • reaching agreement at a strategic level on the vision for the redevelopment of the river corridor • the appropriate location of new development
Regional Priority	Medium. There are opportunities to reduce the consequences of flooding

(0-5yrs)	through the on-going cycle of redevelopment. However in a regional context the current flood risk is small.

	Summary of the Preferred Approach				
Policy Unit	**Upper and Middle Blackwater**				
	What is currently at risk from flooding: Problem / Risk				
Regional Context	**0.7%**	of the economic consequences of fluvial flooding in Thames region			
	0.4%	of the social consequences of fluvial flooding in Thames region			
	0.5%	of the floodplain, channel and designated environmental assets in Thames region			
	Current Risk				
	20% AEP	**5% AEP**	**1% AEP**	**0.1% AEP**	
Properties (from flood zones)			1370	4000	
Properties (from detailed modelling)	0	99	146		
Main clusters or features of the current flood risk	Blackwater Valley				
Area of BAP (km)	0.8km^2 of floodplain BAP habitat, predominantly floodplain grazing marsh in the lower reaches of the policy unit.				
Floodplain area	9km² of floodplain. 45% is urban.				
Watercourse length	30km of channel				
Description of designated sites	Thursley, Ash, Pirbright and Chobham SAC and Thames Basin heaths SPA (not water-dependant)				
	Current responses to flood risk within the policy unit				
Total Maintenance Expenditure	**Approx 243k**				
	Major Assets	**High Risk Systems**	**Low & medium Risk**		
Approx. Expenditure	0	243	0		
Where					
Purpose of Maintenance	Maintenance of channel conveyance.				
Approximate Standards of service that apply	Generally a 5% AEP standard. In some localities there is a higher standard; for example in the Cove Brook.				
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	<1%			
	Detection Improvements: Site planned at Cove Flood Awareness Events: No specific activity planned Forecasting Improvements: No specific activity planned				

Opportunities & Constraints	• Throughout most of the length of the Blackwater there is a green river corridor with the potential for environmental expansion and enhancement. • Redevelopment of industrial areas in the floodplain offers opportunities to reduce the risk of flooding (through more flood compatable layout and design).
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators as the condition of modified watercourses deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration of modified watercourses. Reductions in Development Control activity in this policy unit could also lead to an increase in inappropriate development in the floodplain as there is a lot of growth planned. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience, removing restrictions to flow or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from new defences. P6: Attenuation can reduce the risk to some people and property within the policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change)..
Justification (Balancing Objectives)	Massive housing growth is planned for the Blackwater valley in the next twenty years. The intended outcome from the first action in the Action Plan is to ensure that none of these houses are located in the floodplain and that the run-off is managed such that there is no increase in flood risk elsewhere in the policy unit. The housing growth should not increase flood risk. Policy implementation in the Blackwater is expected to be gradual: • Over the coming decades, some areas of floodplain in the Blackwater Valley will be redeveloped. We will be looking for this redevelopment to be resilient and resistant to flooding. This should lead to a gradual reduction in the consequences of flooding. • There are multiple sources of flooding in Blackwater which is widely distributed across the policy unit. There are some locations where the flood risk is accentuated by existing restrictions to flow (e.g. at bridges and culverts). Removing some of these restrictions will reduce the probability of flooding to some locations – but is funding dependent. These approaches will reduce the consequences and probability of flooding in parts of the policy unit dependent upon the levels of redevelopment and

	funding. There are a number of minor tributaries off of the Blackwater. A worthwhile investigation would be to assess the impact of flood attenuation on these tributaries.
Key Actions (Developed in Action Plan)	**BI1 Land use planning - Short-term planning actions** **BI2 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **BI3 Surface water drainage** **BI4 Maintaining conveyance and current standards of defence** **BI5 Flood Proofing and flood resilience to existing properties** **BI6 Flood warning, flood awareness and emergency planning**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor, the location of new development and the future management of run-off.
Regional Priority (0-5yrs)	High. The right intervention through the planning system now will reduce the long-term consequences of flooding.

	Summary of the Preferred Approach			
Policy Unit	**Addlestone Bourne, Emm Brook, The Cut**			
	What is currently at risk from flooding: Problem / Risk			
Regional Context	**0.5%**	of the economic consequences of fluvial flooding in Thames region		
	0.4%	of the social consequences of fluvial flooding in Thames region		
	0.6%	of the floodplain, channel and designated environmental assets in Thames region		
	Current Risk			
	20% AEP	**5% AEP**	**1% AEP**	**0.1% AEP**
Properties (from flood zones)			1423	2288
Properties (from detailed modelling)	86	133	303	
Main clusters or features of the current flood risk	Bracknell, Bagshot, Lightwater, Wokingham			
Area of BAP (km)	0.5km² mostly wet woodland			
Floodplain area	17.7km^2 of floodplain (15% is urban)			
Watercourse length	78km			
Description of designated sites	Thursley, Ash, Pirbright and Chobham SAC			
	Current responses to flood risk within the policy unit			
Total Maintenance Expenditure	**Approx 252k**			
	Major Assets	**High Risk Systems**	**Low & medium Risk**	
Approx. Expenditure	1	232	19	
Where		Bracknell, Wokingham, Addlestone		
Purpose of	Removal of blockages and obstructions (e.g. from trash screens) and the			

Maintenance	maintenance of channel conveyance.	
Approximate Standards of service that apply	In Wokingham, approx. 2% AEP, elsewhere 5% to 3% AEP.	
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	9%
	Detection Improvements: Site planned near Maidenhead Flood Awareness Events: No specific activity planned Forecasting Improvements: Rainfall runoff models to be delivered	
Opportunities & Constraints	The opportunities to reduce the probability of flooding in this policy unit are quite limited. This is because most flooding is from point sources such as blockages, culverts or surface water systems and it is most likely to occur following intense rainfall, it is very difficult to reduce the probability of flooding through defences. This situation reduces the economic case for progressing flood defence schemes. On the Emm Brook immediately upstream of Wokingham there may be opportunities to attenuate water. The longer-term opportunities to reduce flood risk as part of the ongoing cycle of redevelopment are comparatively limited also. Many of the existing flooding issues have their origin in developments between the 1960s and 1990s and it will be many years before these areas are redeveloped.	
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators as the condition of modified watercourses deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration of modified watercourses. Reductions in Development Control activity in this policy unit could also lead to an increase in inappropriate development in the floodplain as there is a lot of growth planned. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience, removing restrictions to flow or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from new defences. P6: Attenuation can reduce the risk to some people and property within the policy unit.	
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction e.g. for habitat inundation)	
Justification (Balancing	Within Addlestone Bourne, Cut and Emm Brook policy unit, the opportunities to bring about major change is limited. Though it is	

Objectives)	predominantly an urban policy unit, most of the flood risk arises from local sources (for example insufficient capacity at bridges) and flooding can occur quite quickly after rainfall. There are not strategic options to reduce the probability of flooding. The level of regeneration within the floodplain is also low as much of the development took place in the 1960s and 1980s. The policy has been selected to recognise these constraints. In many areas across this policy unit, previous alterations to watercourses may be contributing to flooding. This is because many of the watercourses (particularly in Bracknell) have been straightened and a number of artificial structures (e.g. culverts) have been created. There are low flows in these watercourses for most of the year so debris accumulates and cause flooding after heavy rainfall. Removing these restrictions to flow or naturalising the watercourse may actually reduce the frequency of maintenance needed as well as reduce flood risk locally. This is identified in Action AC4. The policy has been selected to indicate a long-term change in the management of these river systems when the existing assets are due for replacement; • Greater attenuation in the upstream reaches of the Emm Brook • Greater control of urban run-off in Bracknell
Key Actions (Developed in Action Plan)	**AC1 Land use planning - Location of new development and the management of run-** **AC2 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **AC3 Surface water drainage** **AC4 Maintaining conveyance and where practical increase its efficiency** **AC5 Flood proofing and flood resilience to existing properties** **AC6 Safeguard future opportunities to reduce the probability of flooding in the future**
Risks, Uncertainties & Dependencies	There are no significant obstacles to the implementation of this policy. The main risk is that the policy does not meet public expectation. An order of magnitude increase in the funding for Flood Risk Management would be needed before possible minor improvements in conveyance were justified. The policy can be reviewed if this happens.
Regional Priority (0-5yrs)	Low. Recognising the extent of current opportunities.

	Summary of the Preferred Approach					
Policy Unit	**Rural Wey**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**1.3%**	of the economic consequences of fluvial flooding in Thames region				
	0.7%	of the social consequences of fluvial flooding in Thames region				
	2.7%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**

Properties (from flood zones)			2988		4413	
Properties (from MDSF)	461	518	597	629		
Total Damages (£m from MDSF)	22.25	24.16	27.41	29.79		3.81
Projected Damages (£m)						6.86
Residential Damages						0.52
Commercial Damages						3.29
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	518	572	647	707		
Climate Change (Damages)	24.18	26.41	31.50	35.10		4.03
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	57	54	50	78		
Damages: Actual	1.93	2.25	4.09	5.31		0.22
Properties: % Change	12.4%	10.4%	8.4%	12.4%		
Damages: % Change	8.7%	9.3%	14.9%	17.8%		5.7%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-3.69%	-9.27%	-6.87%	-4.29%		
Damages (%)	-6.34%	-4.61%	-6.10%	-6.82%		-5.92%
	Impact of Scenario's on 1% AEP					
	Urbanisation					
Properties: Actual	604					
Damages: Actual	27.80					
Properties: % Baseline change	-1.2%					
Damages: % Baseline change	-1.4%					
Main clusters or features of the current flood risk	People and property at risk of flooding is widely dispersed, with some clusters of property at risk (for example in Farnham, Cranleigh and Godalming)					
Area of BAP (km)	Approximately 3km^2 of floodplain BAP habitat (wet woodland, floodplain grazing marsh and reedbed)					
Floodplain area	38km^2 of floodplain (90% undeveloped and 10% urban)					
Watercourse length	195km of natural channel and 5km of modified channel (at Alton, Farnham and Cranleigh)					

Description of designated sites	Thursley, Ash, Pirbright and Chobham SAC (water-dependant), Thames Basin Heaths SPA, Wealden Heath Phase II SPA, Woolmer Forest SAC, East Hampshire Hangers SAC, Shortheath Common SAC (none are water-dependant).		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 749k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	23	711	15
Where			
Purpose of Maintenance	Maintaining channel conveyance		
Approximate Standards of service that apply	20% AEP for most natural floodplain. 10% AEP to 2% AEP in urban locations.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	15%	
	Detection Improvements: No specific activity planned Flood Awareness Events: No specific activity planned Forecasting Improvements: Routing models to be delivered Rainfall runoff models to be delivered		
Opportunities & Constraints	Maintaining or enhancing floodplain capacity to store water to provide direct environmental benefit and small, localised economic and social benefits. 90% of the floodplain in this policy unit is undeveloped natural floodplain. Small to moderate scale redevelopment of towns provides an opportunity to gradually reduce the consequences of flooding. Long-term river restoration opportunities (perhaps alongside redevelopment); for example in Cranleigh.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection –		

	this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.
Policy	P2: Reduce existing flood risk management actions (accepting that flood risk will increase over time)
Justification (Balancing Objectives)	The policy selection is based on the following; • Less than 1% of the economic and social risk across Thames region is in the Rural Wey • The impacts of climate change are relatively moderate. For example for a 1% AEP flood, the number of properties at risk under a climate change scenario increases only by approximately 8%. • Flood risk is quite dispersed; there is no single strategic solution to reduce the probability of flooding. • There are localities such as Godalming and Cranleigh where the risk of flooding is higher (below the national standard of protection). There is a need to redistribute the use of resource within the policy unit. The outcome of this policy is an increase in the probability of flooding to most areas of natural floodplain, but not in urban locations, where maintenance will be continued. In other comparable policy units (for example the Middle Lee and Stort, Upper Roding, Upper Thames, Loddon) a P6 policy has tended to be selected. P6 has not been selected in this policy unit because; • The impacts within the policy unit of attenuating flows are small. Reducing flows by 10% in this policy unit would lead to a 6% reduction in damages for a 10% AEP flood. • The impacts on downstream policy units (the Lower Thames, Byfleet and Weybridge and Guildford) are also very small and potentially negative in the case of the Lower Thames. • The impacts of climate change are relatively moderate. The middle section of the Wey floodplain is one of the areas with the highest potential for wetland BAP creation across Thames region, due to current soil type, geology and environmental conditions. The Wey already has over 2km² of wetland BAP habitat (mainly consisting of Fen habitat) which is advantageous when looking for suitable locations for new sites. The selected policies provides the potential to expand or enhance these BAP habitats.
Key Actions (Developed in Action Plan)	**RW1 Land use planning** **RW2 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **RW3 Flood warning, flood awareness and emergency planning** **RW4 Flood proofing and flood resilience to existing properties**
Risks, Uncertainties & Dependencies	Dependent on the application of Making Space for Water principles (floodplain management, resilience and resistance measures) for a for a significant change. Dependent upon successful application of the sequential test, community engagement and acceptance of flood risk for an evolutionary change.
Regional Priority (0-5yrs)	Low. Subject to any changes in the main dependencies identified, in the short-term changes in approach within the Rural Wey policy unit will be evolutionary.

	Summary of the Preferred Approach					
Policy Unit	**Guildford**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.3%**	of the economic consequences of fluvial flooding in Thames region				
	0.1%	of the social consequences of fluvial flooding in Thames region				
	0.1%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			495		988	
Properties (from MDSF)	730	789	826	864		
Total Damages (£m from MDSF)	90.95	97.86	107.23	114.04		16.41
Projected Damages (£m)						16.41
Residential Damages						1.50
Commercial Damages						14.91
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	796	823	972	1039		
Climate Change (Damages)	98.19	104.93	118.82	127.95		17.04
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	66	34	146	175		
Damages: Actual	7.24	7.07	11.59	13.90		0.64
Properties: % Change	9.0%	4.3%	17.7%	20.3%		
Damages: % Change	8.0%	7.2%	10.8%	12.2%		3.9%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-4.52%	-4.94%	-1.33%	-4.40%		
Damages (%)	-5.12%	-4.01%	-4.34%	-5.29%		-4.28%
	Impact of Scenarios on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						

Main clusters or features of the current flood risk	Guildford town centre					
Area of BAP (km)	A very small area of wet woodland BAP habitat					
Floodplain area	1.7km^2 of floodplain (nearly 50% of the Guildford floodplain is urban)					
Watercourse length	14km of natural channel					
Description of designated sites	None					
	Current responses to flood risk within the policy unit					
Total Maintenance Expenditure	**Approx 47k**					
	Major Assets		**High Risk Systems**		**Low & medium Risk**	
Approx. Expenditure	47		0		0	
Where	Guildford					
Purpose of Maintenance	Maintain the capacity of the channel and maintenance to existing river control structures.					
Approximate Standards of service that apply	Approximately 10% to 5% AEP.					
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	24%				
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood awareness stand at local event (May 08) Forecasting Improvements: No specific activity planned					
Opportunities & Constraints	Major redevelopment of the urban river corridor through the town centre. It is not affordable, justifiable or sustainable to construct flood defences in Guildford. The implementation of defences and other possible structural interventions (such as a flood tunnel) are therefore unlikely, and currently a long way from attracting the necessary funding. They are not part of our proposed implementation of the selected policy.					
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral.					

	P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P5: Take further action to reduce flood risk
Justification (Balancing Objectives)	The policy for Guildford has been selected because of the level of risk at all return periods and the potential to manage this risk in a sustainable way by reducing the consequences of flooding. Guildford has over 800 properties at risk from flooding concentrated in one location. The MDSF modelling indicates that 700 of these properties could flood in a 10% AEP event. Our judgement is that these properties are more likely to flood in a 5% event, so the damages and the properties at risk for the more frequent flooding have probably been over-estimated in the modelling. There are however a large number of properties at risk from flooding in an urban area where in a national context the current standard of protection is low. One of the key characteristics of Guildford is that both the number of properties at risk and damages are not particularly sensitive to changes in flow. Climate change has only a small impact on damages. Conversely, reducing flow by attenuating water upstream in the Rural Wey policy unit would have only a small impact at Guildford. This suggests that the policy would be best implemented by measures in the policy unit itself, rather than managing the catchment as whole. Within Guildford itself there are no sustainable options to reduce the probability of flooding. The setting and configuration of the town mean that flood defences would be impractical. An option to divert flow around Guildford may be technically feasible, but the cost is likely to be in the range of £30m to £50m. This is disproportionate to the level of risk and will not be considered further, especially when so much of the town centre is undergoing major redevelopment and there may be options to increase the resilience of property that is not being redeveloped. The policy is most likely to be implemented by reducing the consequences of flooding and the actions are designed to achieve this. Initially the focus is on actions to make the urban environment more resilient to flooding through redevelopment.
Key Actions (Developed in Action Plan)	**Gu1 Short-term planning actions - adaptation of the urban environment to be more flood resilient** **Gu2 Flood proofing and flood resilience to existing properties** **Gu3 Maintain existing conveyance** **Gu4 Flood warning, flood awareness and emergency planning**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor that meets the objectives of the Local Planning Authorities and the outcome of flood resilience pilot studies.
Regional Priority (0-5yrs)	Very High. The level of redevelopment taking place in Guildford over the next few years offers a unique opportunity to achieve a more sustainable approach to managing the flood risk.

	Summary of the Preferred Approach				
Policy Unit	**Hoe Stream**				
	What is currently at risk from flooding: Problem / Risk				
Regional Context	**0.2%**	of the economic consequences of fluvial flooding in Thames region			
	0.1%	of the social consequences of fluvial flooding in Thames region			
	0.2%	of the floodplain, channel and designated environmental assets in Thames region			
	Current Risk				
	20% AEP		**5% AEP**	**1% AEP**	**0.1% AEP**
Properties (from flood zones)				260	490
Properties (from detailed modelling)	179		189	189	
Main clusters or features of the current flood risk	Woking				
Area of BAP (km)	1.2km^2 of BAP habitat (reedbed and floodplain grazing marsh)				
Floodplain area	5.6km^2 of floodplain. 12% of the floodplain is urban.				
Watercourse length	27km of channel. Small sections (less than 1km) are artificial.				
Description of designated sites	Thursley, Ash, Pirbright and Chobham SAC, Thames Basin Heaths SPA (not water-dependant)				
	Current responses to flood risk within the policy unit				
Total Maintenance Expenditure	**Approx 47k**				
	Major Assets		**High Risk Systems**	**Low & medium Risk**	
Approx. Expenditure	0		47	0	
Where					
Purpose of Maintenance	Maintenance of channel conveyance.				
Approximate Standards of service that apply	10% AEP.				
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD		19%		
	Detection Improvements: Raingauge planned at Pirbright Flood Awareness Events: No specific activity planned Forecasting Improvements: No specific activity planned				
Opportunities & Constraints	There are technically viable options to reduce the probability of flooding in Woking through the provision of flood defences and associated flood storage. The proposed scheme will also include environmental and habitat enhancements through the river corridor.				
Assessment of proposed approach (Against Economic, Social and Environmental	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration				

Indicators)	in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P5: Take further action to reduce flood risk
Justification (Balancing Objectives)	The selected policy for the Hoe Stream recognises; • Most of the properties at risk in a 1% AEP flood are also at risk in a 10% AEP event. • The potential to reduce risk through flood defences in a sustainable manner and the very high proportion of properties that are at risk from low order flood events. The estimated cost of options to reduce the probability of flooding is £3m to £5m.
Key Actions (Developed in Action Plan)	**HS1 Land use planning** **HS2 Flood warning, flood awareness and emergency planning** **HS3 Hoe Stream Flood Risk Management Strategy**
Risks, Uncertainties & Dependencies	The main dependency for taking forward the proposed policy relate to the criteria for investment.
Regional Priority (0-5yrs)	High. Recognising the existing opportunity to reduce flood risk to the majority of properties in the policy unit.

	Summary of the Preferred Approach					
Policy Unit	**Byfleet & Weybridge**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.9%**	of the economic consequences of flooding in Thames region				
	0.3%	of the social consequences of flooding in Thames region				
	0.2%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			1258		4389	
Properties (from MDSF)	435	531	842	994		

Total Damages (£m from MDSF)	23.77	28.24	35.29	44.79		4.64
Projected Damages (£m)						6.18
Residential Damages						0.92
Commercial Damages						3.72
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	548	783	1045	1119		
Climate Change (Damages)	28.34	33.24	46.81	50.36		5.18
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	113	252	203	125		
Damages: Actual	4.58	5.00	11.52	5.57		0.54
Properties: % Change	26.0%	47.5%	24.1%	12.6%		
Damages: % Change	19.3%	17.7%	32.6%	12.4%		11.6%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-6.90%	-15.44%	-19.71%	-13.88%		
Damages (%)	-11.36%	-9.21%	-9.71%	-20.73%		-9.97%
	Impact of Scenarios on 1% AEP					
	100% storage - Thame	100% storage - Kennet	100% storage - Loddon	Flood Relief Channels		
Properties: Actual	764	733	764	728		
Damages: Actual	34.21	34.09	34.23	33.93		
Properties: % Baseline change	-9.3%	-12.9%	-9.3%	-13.5%		
Damages: % Baseline change	-3.1%	-3.4%	-3.0%	-3.8%		
Main clusters or features of the current flood risk	Weybridge (near the confluence with the Thames), Woodham					
Area of BAP (km)	A very small area of BAP habitat (wet woodland)					
Floodplain area	7.2km^2 of floodplain. Approximately 50% is urban.					
Watercourse length	21km of which 1.5km is modified					
Description of designated sites	None					

	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 18k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	18	0	0
Where			
Purpose of Maintenance	Maintain the capacity of the River Wey channel.		
Approximate Standards of service that apply	Approximately 10% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	40%	
	No specific activities planned		
Opportunities & Constraints	Redevelopment of some sites.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: It is not viable to implement this policy in a meaningful way in this policy unit.		
Policy	P5: Take further action to reduce flood risk		
Justification (Balancing Objectives)	The policy for Byfleet and Weybridge has been selected because of the level of risk at all return periods and the potential to manage this risk in a sustainable way by reducing either or both the probability and consequences of flooding. Byfleet and Weybridge has over 1000 properties at risk from flooding concentrated in one location. By national standards, the current standard of		

	protection, which is estimated at a 10% to 5% AEP is low. One of the key characteristics of Byfleet and Weybridge is that both the number of properties at risk and damages are not particularly sensitive to changes in flow. Climate change has only a small impact on damages. Conversely, reducing flow by attenuating water upstream in the Rural Wey policy unit would have only a small impact. This suggests that the policy would be best implemented by measures in the policy unit itself, rather than managing the catchment as whole. Within Byfleet and Weybridge there are potentially sustainable options to reduce the probability of flooding to some of the properties at risk. There are some technical uncertainties associated with the potential options, but our judgement is that these can be overcome. A far more significant uncertainty is whether the potential schemes would be economically justified. Based on comparable scale schemes elsewhere, schemes in this policy unit are estimated at between £2m and £10m. Recognising the uncertainties, the potential schemes will be investigated further. Any flood defences have the potential to increase conveyance and therefore increase flows into the downstream Lower Thames policy unit where over 30,000 properties are at risk from flooding. The Broad Scale modelling indicates that this could have a small, but **beneficial** impact on the Lower Thames. This is because in a typical flood, water from the River Wey discharges into the Lower Thames just before the onset of serious flooding (the source of serious flooding in the Lower Thames is mainly water from upstream on the Thames). If conveyance from the Wey is increased and the water discharges more rapidly then this reduces the likelihood of flows from the Thames and Wey combining in the Lower Thames. In all likelihood the effect of any possible scheme at Byfleet on the Thames will be insignificant and not measurable. At a catchment scale, we can be satisfied that if there is an impact from the policy and its implementation, it is more likely to be positive than negative.
Key Actions (Developed in Action Plan)	**BW1 Land use planning** **BW2 Flood warning, flood awareness and emergency planning** **BW3 Wey Flood Risk Management Strategy - Safeguard future opportunities to reduce the probability of flooding in the future** **BW4 Maintain existing conveyance**
Risks, Uncertainties & Dependencies	The risks, uncertainties and dependencies are not as acute in this policy unit as others in the region. Flood defences or flood resilience would be required to bring about major reductions in flood risk and enable a P5 policy to be implemented. There are significant uncertainties associated with the more widespread adoption of flood resilience as an approach. In Byfleet and Weybridge the uncertainties associated with flood defences are mainly financial, though there are technical constraints associated with defending some areas.
Regional Priority (0-5yrs)	Medium. Providing existing practices continue (maintenance continues to reduce the impacts of low order flood events (up to a 20% to 10% AEP), flood warning services are maintained and PPS25 is applied) the current risk in Byfleet and Weybridge will not change significantly in the short-term. If schemes to reduce the probability of flooding do prove viable, they should be as viable in the future as they are now.

	Summary of the Preferred Approach					
Policy Unit	**Windsor & Maidenhead**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**4.4%**	of the economic consequences of fluvial flooding in Thames region				
	4%	of the social consequences of fluvial flooding in Thames region				
	0.5%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			11242		14605	
Properties (from MDSF)	1426	3196	8010	10826		
Total Damages (£m from MDSF)	16.91	30.60	122.63	325.43		7.48
Projected Damages (£m)						9.64
Residential Damages						4.39
Commercial Damages						3.09
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	3446	6794	11831	12387		
Climate Change (Damages)	33.69	87.25	426.91	505.01		12.95
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	2020	3598	3821	1561		
Damages: Actual	16.78	56.65	304.28	179.58		5.46
Properties: % Change	141.7%	112.6%	47.7%	14.4%		
Damages: % Change	99.2%	185.1%	248.1%	55.2%		73.0%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-33.59%	-41.96%	-34.39%	-18.20%		
Damages (%)	-29.41%	-31.34%	-55.46%	-37.27%		-38.12%
	Impact of Scenarios on 1% AEP					
	Strategic Storage	16Mm³ storage in Upper Thames	100% storage - Cherwell	100% storage - Thame	100% storage - Kennet	Glasswalling d/s of Reading
Properties: Actual	6341	6542	5868	4157	4553	9160
Damages: Actual	75.92	82.53	65.98	40.49	44.98	217.92
Properties: % Baseline change	-26.3%	-18.3%	-26.7%	-48.1%	-43.2%	14.4%
Damages: %	-38.1%	-32.7%	-46.2%	-67.0%	-63.3%	77.7%

Baseline change						
Main clusters or features of the current flood risk	Cookham, Maidenhead, Slough, Windsor					
Area of BAP (km)	0.25km^2 of floodplain BAP habitat (floodplain grazing marsh)					
Floodplain area	34km^2 of floodplain. 30% of the floodplain is urban.					
Watercourse length	90km of channel. 41km of modified or artificial channel.					
Description of designated sites and BAP	Burnham Beeches SAC (not in the floodplain)					
	Current responses to flood risk within the policy unit					
Total Maintenance Expenditure	**Approx 525k**					
	Major Assets		**High Risk Systems**		**Low & medium Risk**	
Approx. Expenditure	329		196		0	
Where	Jubilee River					
Purpose of Maintenance	Maintenance of the Jubilee River and the associated structures.					
Approximate Standards of service that apply	5% to 2% AEP.					
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	2%				
	No specific activities planned					
Opportunities & Constraints	• To continue to reduce the risk of flooding through the maintenance and operation of the MWEFAS scheme. • Restoring rivers to a more natural state, particularly within Slough. • Expansion of BAP habitat within the natural floodplain.					
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels.					

	Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Additional defences are not considered viable in the foreseeable future. P6: We would be looking to implement this policy over the long-term when the existing defences are replaced so that there we achieve a degree of attenuation in the catchment. This could have positive impacts on environmental, social and economic indicators.
Policy	P3: Continue with existing or alternative actions to manage flood risk at the current level
Justification (Balancing Objectives)	No new flood defences will be constructed in this policy unit, so the probability of flooding will remain at current day levels or increase with climate change. We have identified actions that will gradually reduce the consequences of flooding, most notably through flood warning and spatial planning. However, with so many properties at risk in this policy unit, it is uncertain whether the consequences can be reduced at a fast enough pace to offset the impacts from climate change. Policy Option 3 has been selected to reflect this position. Upstream attenuation associated with reducing flood risk to Oxford or Reading would contribute (in a very small way) to reducing the probability of flooding in this policy unit.
Key Actions (Developed in Action Plan)	**WM1 Maintain existing defences** **WM2 Land use planning** **WM3 Flood warning, flood awareness and emergency planning** **WM4 Flood proofing and flood resilience to existing properties**
Risks, Uncertainties & Dependencies	• Reaching agreement at a strategic level on the location of new development and the layout and design of redevelopment for those areas at risk of flooding. • Continued maintenance and operation of the MWEFAS scheme There is some uncertainty whether the reductions in the consequences of flooding can keep pace with the increase in the probability of flooding from climate change.
Regional Priority (0-5yrs)	Medium. Flood defences reduce the risk of flooding to the majority of people at risk in this policy unit. However, it is important that the opportunities that will lead to longer-term change in the character of the urban floodplains are taken.

	Summary of the Preferred Approach	
Policy Unit	**Lower Thames**	
	What is currently at risk from flooding: Problem / Risk	
Regional Context	**20%**	of the economic consequences of fluvial flooding in Thames region
	8%	the social consequences of fluvial flooding in Thames region
	1%	of the floodplain, channel and designated environmental assets in

		Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			32786		44665	
Properties (from MDSF)	14617	19445	26868	30926		
Total Damages (£m from MDSF)	257.61	477.60	1049.75	1501.20		76.83
Projected Damages (£m)						90.70
Residential Damages						42.75
Commercial Damages						34.08
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	20170	25595	32225	33027		
Climate Change (Damages)	521.40	921.82	1690.20	1724.96		104.01
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	5553	6150	5357	2101		
Damages: Actual	263.79	444.22	640.45	223.76		27.18
Properties: % Change	38.0%	31.6%	19.9%	6.8%		
Damages: % Change	102.4%	93.0%	61.0%	14.9%		35.4%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-17.64%	-15.44%	-12.23%	-12.63%		
Damages (%)	-26.86%	-31.70%	-30.19%	-29.15%		-28.85%
	Impact of Scenario's on 1% AEP					
	Strategic storage	16Mm³ storage in the Upper Thames	100% storage - Thame	100% storage - Kennet	100% storage - Loddon	Flood Relief Channels
Properties: Actual	25521	26072	22497	22289	24820	20627
Damages: Actual	907.47	961.45	650.14	640.64	850.88	546.11
Properties: % Baseline change	-5.3%	-3.0%	-16.3%	-17.0%	-7.6%	-23.2%
Damages: % Baseline change	-13.6%	-8.4%	-38.1%	-39%	-18.9%	-48.0%
Main clusters or features of the current flood risk	Large concentrations of properties at risk along the length of the River Thames in this policy unit including Slough, Staines, Chertsey and Thames Ditton					

Area of BAP (km)	1.89 km^2 of floodplain BAP habitat (mainly reedbed).		
Floodplain area	70km^2 of floodplain. 37% of the floodplain is urban		
Watercourse length	130km of channel (approx 70km of channel has been modified)		
Description of designated sites	The South West London Waterbodies SPA is located in the Lower Thames floodplain. Windsor Forest and Great Park SAC is also within this policy unit but is not water-dependant.		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 406k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	257	147	2
Where	Thames locks and weirs		
Purpose of Maintenance	Maintenance of the locks and weirs.		
Approximate Standards of service that apply	10% to 5% AEP		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	18%	
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood Awareness stand at local event (May 08 and Jul 08). Flood information day (Mar 09) Forecasting Improvements: Refinements to existing hydrodynamic model		
Opportunities & Constraints	The ongoing cycle of redevelopment to reduce flood risk.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The impact on environmental indicators would be neutral providing any defences		

	compensated for any habitat loss. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P5: Take further action to reduce flood risk.
Justification (Balancing Objectives)	The policy has been selected because; • The level of economic risk in the Lower Thames is significant in both a national and regional context. There are over 30,000 properties at risk in the Lower Thames policy unit. • The standard of protection in the Lower Thames is low. The MDSF modelling has over-estimated the number of properties at risk in the 10% AEP flood, but previous flood events such as January 2003 demonstrate that several hundred properties are vulnerable to this relatively frequent flooding. • This is also a policy unit where the impacts of climate change are quite discernable. Damages for a 1% AEP flood increase by 61%. There are considerable economic, technical and environmental uncertainties on how the P5 could ever be implemented; • Upstream flood storage could have a positive impact on the Lower Thames policy unit. However to reduce the number of properties at risk and flood damages by about 20% would require 10% of flow from the Thames and all of its tributaries to be attenuated. We have selected policies in some upstream policy units that will encourage greater attenuation, but it is highly unlikely that this level of attenuation can ever be achieved. • Flood relief channels could reduce some of the risk to some of the policy unit. However, it will not be possible to construct flood relief channels to a 1% AEP standard and the cost is likely to be in the order of £200m. A Lower Thames strategy is being progressed at the moment.
Key Actions (Developed in Action Plan)	**LT1 Lower Thames Flood Risk Management Strategy** **LT2 Shorter-term land use planning actions** **LT3 Long-term adaptation of the urban environment to be more flood resilient** **LT4 Flood warning, awareness and emergency planning** **LT5 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	There are a wide range of technical, environmental and economic uncertainties in bringing about a large scale and widespread reduction in the probability of flooding in the Lower Thames. It is important to safeguard sites that may be needed to reduce the probability of flooding in the future.
Regional Priority (0-5yrs)	Medium. If a scheme to reduce the probability of flooding does prove viable, it should be as viable in the future as it is now providing land is safeguarded from development.

	Summary of the Preferred Approach			
Policy Unit	**Upper Mole**			
	What is currently at risk from flooding: Problem / Risk			
Regional Context	**1.2%**	of the economic consequences of fluvial flooding in Thames region		
	0.7%	of the social consequences of fluvial flooding in Thames region		
	0.9%	of the floodplain, channel and designated environmental assets in Thames region		
	Current Risk			
	20% AEP	**5% AEP**	**1% AEP**	**0.1% AEP**
Properties (from flood zones)			2750	5140
Properties (from detailed modelling)	95	368	765	
Main clusters or features of the current flood risk	Crawley (from the Gatwick Stream and Tilgate Brook) and Horley (from the River Mole, Burstow Stream and Gatwick Stream)			
Area of BAP (km)	0.25km^2 of wet woodland BAP habitat			
Floodplain area	23 km². Over 70% is rural.			
Watercourse length	98km of natural channel and approximately 5km of culverts			
Description of designated sites	None			
	Current responses to flood risk within the policy unit			
Total Maintenance Expenditure	**Approx 246k**			
	Major Assets	**High Risk Systems**	**Low & medium Risk**	
Approx. Expenditure	0	232	14	
Where				
Purpose of Maintenance	Maintenance of conveyance in urban areas and the removal of blockages and obstructions to flow.			
Approximate Standards of service that apply	Highly variable. Typically 5% to 3% AEP.			
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	2%		
	Detection Improvements: Site planned at Crawley Flood Awareness Events: Flood information days (Mar 09) Forecasting Improvements: Rainfall runoff models to be delivered			
Opportunities & Constraints	Often flood warning lead times (reflecting the location at the top of the catchment and existing problems with surface water flooding). There is considerable development planned in the Upper Mole. This has the potential to increase flood risk if the development is located in areas at risk from flooding, or too increase the risk to others by increasing run-off. Redevelopment of many areas on the other hand, provides opportunities to reduce flood risk (reducing run-off, opening up culverts and river corridors, more resilience into new buildings.)			
Assessment of proposed	P1: Leads to a large increase in risks to economic and social indicators as the condition of modified watercourses deteriorate. There are no benefits to			

approach (Against Economic, Social and Environmental Indicators)	environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration of modified watercourses. Reductions in Development Control activity in this policy unit could also lead to an increase in inappropriate development in the floodplain as there is a lot of growth planned. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience, removing restrictions to flow or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from new defences. P6: Attenuation can reduce the risk to some people and property within the policy unit.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction e.g. for habitat inundation)
Justification (Balancing Objectives)	There are over 2,500 properties at risk in the Upper Mole, along with a major international airport at Gatwick. Flooding can occur quite rapidly in the Upper Mole because it is located at the headwaters of the catchment. There is a lot of development pressure and there are risks from surface water flooding as well as fluvial flooding. The Upper Mole policy unit is therefore finely balanced. Interventions will be progressed over the next few years to reduce the probability of flooding to some areas through flood storage. In addition to this, the right type and level of intervention over the next five years to influence the future planning issues will lead to a net reduction in the consequences of flooding that can offset some of the impacts of climate change. Failure to do this would have a regionally measurable impact on the baseline level of flood risk. The actions are intended to make the most of these opportunities. The policy selection supports the progression of flood storage options and Sustainable urban drainage schemes to reduce the flood risk to people and critical infrastructure including Gatwick Airport.
Key Actions (Developed in Action Plan)	**UM1 Land use planning - Location and design of new development and the management of run-off** **UM2 Land use planning - Short-term planning actions** **UM3 Surface water drainage** **UM4 Progress approved options to improve the current standards of defence** **UM5 Flood Proofing and flood resilience to existing properties**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor, the location of new development and the future management of run-off.

	Removal of existing restrictions to flow in urban areas are largely, though not exclusively, dependent upon funding levels and their impact would need to be more fully assessed to determine whether they are justified and sustainable.
Regional Priority (0-5yrs)	High. The right intervention through the planning system now will reduce the long-term consequences of flooding.

	Summary of the Preferred Approach				
Policy Unit	**Middle Mole**				
	What is currently at risk from flooding: Problem / Risk				
Regional Context	**0.5%**	of the economic consequences of fluvial flooding in Thames region			
	0.2%	of the social consequences of fluvial flooding in Thames region			
	0.2%	of the floodplain, channel and designated environmental assets in Thames region			
	Current Risk				
	20% AEP		**5% AEP**	**1% AEP**	**0.1% AEP**
Properties (from flood zones)				700	2370
Properties (from detailed modelling)					
Main clusters or features of the current flood risk	The main locations at risk from flooding are Dorking, Leatherhead and Cobham				
Area of BAP (km)	There is a small amount of floodplain BAP habitat in the Middle Mole (0.33km^2 of wet woodland and fen). Overall, the Middle Mole is a high quality river environment.				
Floodplain area	21km² of which almost 90% is rural				
Watercourse length	13km of which approximately 2km is maintained channel, including 0.6km of culvert				
Description of designated sites	Mole Gap to Reigate Escarpment SAC (not water-dependant)				
	Current responses to flood risk within the policy unit				
Total Maintenance Expenditure	**Approx 162k**				
	Major Assets		**High Risk Systems**	**Low & medium Risk**	
Approx. Expenditure	0		70	92	
Where					
Purpose of Maintenance	Maintain the capacity of the channel to convey water through the towns and villages.				
Approximate Standards of service that apply	Typically 5% to 2% in urban locations and 10% in areas of natural floodplain.				
Flood Warning	Proportion signed-up to FWD			20%	

(activities planned in 2008-09)	Detection Improvements: Site planned at Brockham Flood Awareness Events: Flood Awareness stand at local event (Jun 08), Flood info days (Mar 09) Forecasting Improvements: Routing models to be delivered
Opportunities & Constraints	There are no regionally significant opportunities or constraints in the Middle Mole. Opportunities to restore river channel and create BAP habitat are enhanced under this policy. This is because there is an emphasis on the layout of redeveloped sites within the floodplain.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.
Policy	P3: Continue with existing or alternative actions to manage flood risk at the current level
Justification (Balancing Objectives)	A relatively small proportion of the region's economic, social and environmental floodplain assets are located in the Middle Mole. Existing practice to manage the probability of flooding are broadly sustainable (they are based on watercourse maintenance and utilising the natural floodplain) and balance flood risk and environmental considerations. Increasing maintenance expenditure, for instance, in this policy unit does not reduce the flood risk in any significant way. This is why we have selected a P3 policy. Changes in flood risk in the Middle Mole policy unit will be gradual. The probability will increase because of climate change and no major interventions are envisaged to reduce the probability of flooding in the immediate future. Equally the ongoing cycle of redevelopment provides a mechanism (with the appropriate application of PPS25) for slowly reducing the consequences of flooding.
Key Actions	**MM1 Land use planning**

(Developed in Action Plan)	**MM2 Efficient and effective targeting of maintenance** **MM3 Flood warning, flood awareness and emergency planning** **MM4 Flood proofing and flood resilience to existing properties**
Risks, Uncertainties & Dependencies	The capacity of the watercourse (along with the maintenance carried out) and the largely undeveloped natural floodplain reduce flood risk to people and property in the Middle Mole. Our management of the probability of flooding is dependent upon this existing floodplain being safeguarded from future development. The impacts of climate change will increase the probability of flooding – reducing the consequences of flooding will be dependent upon resilience / resistance measures becoming stronger drivers for investment or the ability of communities to self-help through such mechanisms.
Regional Priority (0-5yrs)	Low. Recognising the relatively moderate flood risk and lack of sustainable opportunities to significantly reduce the probability of flooding.

	Summary of the Preferred Approach					
Policy Unit	**Lower Mole**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.6%**	of the economic consequences of fluvial flooding in Thames region				
	0.5%	of the social consequences of fluvial flooding in Thames region				
	0.0%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			1971		8956	
Properties (from MDSF)	76	187	467	710		
Total Damages (£m from MDSF)	0.80	2.57	11.09	24.35		0.58
Projected Damages (£m)						1.02
Residential Damages						0.28
Commercial Damages						0.30
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	197	403	887	988		
Climate Change (Damages)	2.76	8.28	36.41	39.87		1.01
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	121	216	420	278		
Damages: Actual	1.96	5.71	25.32	15.52		0.43
Properties: % Change	159.2%	115.5%	89.9%	39.2%		
Damages: % Change	243.2%	222.4%	228.2%	63.7%		74.2%

	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-13.16%	-38.50%	-34.48%	-33.80%		
Damages (%)	-16.47%	-61.36%	-48.82%	-52.45%		-46.46%
	Impact of Scenario's on 1% AEP					
	Strategic Storage	Urbanisation	100% storage - Kennet	100% storage - Loddon	100% storage - Wey	Flood Relief Channels
Properties: Actual	422	526	381	318	260	579
Damages: Actual	10.22	12.35	7.31	6.29	4.48	13.96
Properties: % Baseline change	-10.7%	12.6%	-18.4%	-31.9%	-44.3%	24.0%
Damages: % Baseline change	-7.8%	1.4%	-34.1%	-43.3%	-59.6%	25.8%

Main clusters or features of the current flood risk	East Molesey and also near the confluence with the Thames
Area of BAP (km)	None
Floodplain area	10.4km² of which approximately 50% is rural
Watercourse length	15km of watercourse. Almost the entire length of the watercourse has been modified with raised defences, modified channel and bank protection
Description of designated sites	None

	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 254k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	93	161	0
Where	Lower Mole FAS		
Purpose of Maintenance	Maintenance of the Lower Mole defences.		
Approximate Standards of service that apply	0.5% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	9%	
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood information days (Mar 09) Forecasting Improvements: No specific activity planned		

Opportunities & Constraints	Opportunities to reduce the residual risk of flooding: • Redevelopment reducing the consequences of flooding. Even with the current levels of protection all redevelopment should be flood resilient to reduce the very long-term dependency on the existing assets. • Extension of the Direct Flood Warning service in the Lower Mole
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Additional defences are not considered viable in the foreseeable future. P6: We would be looking to implement this policy over the long-term when the existing defences are replaced so that there we achieve a degree of attenuation in the catchment. This could have positive impacts on environmental, social and economic indicators.
Policy	P3: Continue with existing or alternative actions to manage flood risk at the current level
Justification (Balancing Objectives)	The Lower Mole is defended to a very high standard. Without these defences, over 8000 properties would be vulnerable to flooding that occurs between 10% and 1% AEP. Deterioration of the Lower Mole flood defences would therefore have a regionally significant impact by increasing the economic and social consequences of flooding across the region in the order of 3% to 4%. To meet our overall aim of achieving the optimum balance of policy and response to reduce the economic and social impacts of increased flood risk, a relatively modest continued investment to maintain the defences contributes to large-scale risk reduction. Actions are also aimed at reducing the consequences of flooding in the very long-term. Whether there will have been sufficient redevelopment in the policy unit that we may be able to reduce our dependency on the Lower Mole defences is at present uncertain. The actions are designed to provide an opportunity for this dependency to be reduced.
Key Actions (Developed in	**LM1 Maintain existing defences** **LM2 Land use planning to reduce our long-term dependency on existing**

Action Plan)	**flood defences** **LM3 Flood warning, flood awareness and emergency planning**
Risks, Uncertainties & Dependencies	There are no regionally significant risks, uncertainties and dependencies in the Lower Mole.
Regional Priority (0-5yrs)	Low. The existing Lower Mole defences are in very good condition and provide a very high standard of protection from fluvial flooding. Continued application of PPS25 will, in the long-term, reduce residual flood risk and the dependency on existing flood defences.

	Summary of the Preferred Approach				
Policy Unit	**Colne tributaries and Wye**				
	What is currently at risk from flooding: Problem / Risk				
Regional Context	**1.1%**	of the economic consequences of fluvial flooding in Thames region			
	0.6%	of the social consequences of fluvial flooding in Thames region			
	1.2%	of the floodplain, channel and designated environmental assets in Thames region			
	Current Risk				
	20% AEP		**5% AEP**	**1% AEP**	**0.1% AEP**
Properties (from flood zones)				2310	3860
Properties (from detailed modelling)					
Main clusters or features of the current flood risk	A large proportion of the properties at risk are dispersed widely across this predominantly rural policy unit, however there are clusters of the properties at risk in the urban centres of High Wycombe and Hemel Hempstead				
Area of BAP (km)	0.9km^2 of floodplain BAP habitat (predominantly floodplain grazing marsh with small areas of fen). Many of the rivers are classified as Chalk stream BAP habitats.				
Floodplain area	12.8km^2 of floodplain. 30% of the floodplain is urban.				
Watercourse length	130km of which 17km is modified or artificial channel.				
Description of designated sites	Chilterns Beechwood SAC (not in the floodplain)				
	Current responses to flood risk within the policy unit				
Total Maintenance Expenditure	**Approx 615k**				
	Major Assets		**High Risk Systems**		**Low & medium Risk**
Approx. Expenditure	10		594		11
Where					
Purpose of Maintenance	Maintaining channel conveyance.				
Approximate Standards of service that apply	10% to 2% AEP is typical through the urban areas.				
Flood Warning	Proportion signed-up to FWD			10%	

(activities planned in 2008-09)	Detection Improvements: No specific activity planned Flood Awareness Events: No specific activity planned Forecasting Improvements: Routing models to be delivered
Opportunities & Constraints	We have determined there are no opportunities for strategic-scale flood risk intervention within this policy unit. Many of the flood risks in these catchments are localised and therefore lend themselves more to localised options. Through the application of PPS25. Strategic Flood Risk Assessments in this policy unit, there are opportunities to; • Apply the sequential test – including identifying long-term opportunities to remove development from the floodplain through land swapping. • Agree an appropriate definition of functional floodplain. • Ensure that any redevelopment within the floodplain that is justified on wider sustainability grounds is resilient to flooding. There are opportunities to improve conveyance in urban locations e.g. Berkhampstead, Amersham and High Wycombe and at the same time achieve a more natural river environment. In these areas there have been some significant modifications to the channel, including long sections of culvert.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: Is not viable in this policy unit.
Policy	P3: Continue with existing or alternative actions to manage flood risk at the current level
Justification (Balancing Objectives)	Flood risk in this policy unit is moderate in the context of Thames region (with approximately 1% of the regions economic consequences of fluvial flooding). There are limitations on the management of both the probability

	and consequences of flooding in this policy unit. The selected policy recognises the level of risk and that there will only be small scale changes to the risk and its management in the foreseeable future. The overall impact of the policy in terms of approach and actions is; • Reduce the general expenditure on maintenance outside of urban areas. • Increase conveyance in urban locations which may necessitate short-term increases in expenditure to remove obstructions to flow where justified. In many areas across this policy unit, previous alterations to watercourses may be contributing to flooding. This is because many of the watercourses have been straightened and a number of artificial structures (e.g. culverts) have been created. Removing these restrictions to flow or naturalising the watercourse may actually reduce the frequency of maintenance needed as well as reduce flood risk locally. This is identified in Action CT3. • Reducing uncertainties associated with surface water flooding. In summary, we are looking to use a similar level of resource in this policy unit, but focus on a different blend of activity.
Key Actions (Developed in Action Plan)	**CT1 Land use planning - Short-term land use planning actions** **CT2 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **CT3 Efficient and effective targeting of maintenance** **CT4 Flood warning, flood awareness and emergency planning** **CT5 Flood proofing and flood resilience to existing properties** **CT6 Surface water run-off**
Risks, Uncertainties & Dependencies	The key dependencies and uncertainties include; • Future arrangements for the strategic management of urban drainage • Long-term patterns of rainfall and their impact on groundwater • An agreed vision for river corridors with Local Planning Authorities
Regional Priority (0-5yrs)	Low for the next five years. The opportunities to reduce flood risk are constrained in this policy unit.

	Summary of the Preferred Approach					
Policy Unit	**Colne**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**2.8%**	of the economic consequences of fluvial flooding in Thames region				
	1.0%	of the social consequences of fluvial flooding in Thames region				
	2.4%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			3563		7172	
Properties (from MDSF)	4399	4977	6891	7595		
Total Damages (£m from MDSF)	266.46	311.89	415.50	499.16		52.72
Projected						52.72

Damages (£m)						
Residential Damages						6.26
Commercial Damages						46.46
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	4906	6043	7723	7972		
Climate Change (Damages)	306.24	368.80	520.87	566.93		57.30
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	507	1066	832	377		
Damages: Actual	39.77	56.91	105.38	67.76		4.58
Properties: % Change	11.5%	21.4%	12.1%	5.0%		
Damages: % Change	14.9%	18.2%	25.4%	13.6%		8.7%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-6.71%	-5.89%	-12.47%	-6.57%		
Damages (%)	-8.01%	-8.07%	-12.00%	-11.58%		-8.58%
	Impact of Scenario's on 1% AEP					
	Urbanisation					
Properties: Actual	7295					
Damages: Actual	460.10					
Properties: % Baseline change	-5.9%					
Damages: % Baseline change	-10.7%					
Main clusters or features of the current flood risk	Rickmansworth, Watford					
Area of BAP (km)	2.2km^2 of BAP habitat (reedbed, fen and floodplain grazing marsh)					
Floodplain area	34km^2 of floodplain. 20% of the floodplain is urban.					
Watercourse length	205km of channel. 8km of modified or artificial channel.					
Description of designated sites	None					
	Current responses to flood risk within the policy unit					
Total Maintenance Expenditure	**Approx 1099k**					

	Major Assets	High Risk Systems	Low & medium Risk
Approx. Expenditure	167	932	0
Where			
Purpose of Maintenance	Maintenance of the Lower Colne defences and maintenance of channel conveyance elsewhere in the policy unit.		
Approximate Standards of service that apply	Parts of the Lower Colne are protected to a 1% AEP standard. Elsewhere, the standard of protection is in the range 10% to 2% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	35%	
	Detection Improvements: Site planned at Borehamwood Flood Awareness Events: Flood Awareness stand at local event (May 08) Forecasting Improvements: Routing models to be delivered Rainfall runoff models to be delivered		
Opportunities & Constraints	There are significant technical constraints to developing structural flood alleviation options in the Colne. For example; • The wide, flat Colne floodplain makes the provision of flood storage impractical. • In locations such as Watford, previous channel modifications and the extent of existing development onto the floodplain limits the scope of large-scale structural options. The opportunities to further reduce flood risk in the Colne policy unit using existing flood risk management approaches are therefore limited. There are opportunities to restore rivers in urban aeras and expand or enhance the existing BAP habitat within the natural floodplain.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators. The benefits of a do nothing approach on environmental indicators is marginal at best. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators and a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and would certainly not be sustainable. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not reduce the risk to all people and property in the policy unit. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss.		

	P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	The flood damages and number of properties at risk has been over-estimated by the Broad scale and MDSF modelling. However, there are over 3,500 properties at risk in the Colne policy unit. Some parts of the policy unit are vulnerable to quite frequent flooding and standards of protection are low by national standards (apart from in the Lower Colne). The selected policy recognises these risks. There are many uncertainties associated with the implementation of the policy as there are many constraints; • Some of the approaches that we are proposing in other rural catchments will not be so effective in the Colne. For example, water attenuation will only have a very small impact and there is little opportunity to actually implement these approaches. Reducing flows by 10% in the Colne would reduce flood damages in the order of 8% and 10% for a 10% AEP flood and 1% AEP flood respectively. • The opportunities to attenuate flow are limited in the Colne. The floodplain is wide and very flat and the upstream tributaries are groundwater fed. • In general options to reduce the probability of flooding to those areas where there are many properties at risk (for example, Watford) are constrained by previous channel alterations and lack of open space within the urban floodplain. Our long-term planning actions are intended to restore some opportunities to reduce the probability of flooding as well as reducing the consequences by increasing the resilience of the urban environment. The focus in the Colne is therefore to manage the flood risk to existing economic and social receptors, recognising the limitations of some of our traditional approaches. An emphasis on planning and changing the character of what is at risk in the floodplain provides the clearest signal of how we intend to manage the risk in the future. The Colne has a very wide and flat floodplain. Attenuation options would be extremely difficult to implement and are unlikely to be cost effective. Therefore P6 is not a viable policy in this policy unit.
Key Actions (Developed in Action Plan)	**Co1 Maintain the Lower Colne defences** **Co2 Efficient and effective targeting of maintenance** **Co3 Flood warning, flood awareness and emergency planning** **Co4 Land use planning - Short-term land use planning actions** **Co5 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **Co6 Safeguard future opportunities to reduce the probability of flooding in the future**
Risks, Uncertainties & Dependencies	Implementation of the proposed approach to implementing policy in the Colne policy unit is dependent upon; • Safeguarding existing open space • That Local Authorities and the Environment Agency have a common understanding and shared vision of future land use within the floodplain.

	• Adoption of appropriate policies within LDFs • Wider application of Making Space for Water principles (notably the use of flood resilience.
Regional Priority (0-5yrs)	Low. However it is very important that policies within LDFs provide the basis for taking forward spatial planning actions.

	Summary of the Preferred Approach			
Policy Unit	**Pinn**			
	What is currently at risk from flooding: Problem / Risk			
Regional Context	**1.1%**	of the economic consequences of fluvial flooding in Thames region		
	0.4%	of the social consequences of fluvial flooding in Thames region		
	0.6%	of the floodplain, channel and designated environmental assets in Thames region		
	Current Risk			
	20% AEP	**5% AEP**	**1% AEP**	**0.1% AEP**
Properties (from flood zones)			1410	2630
Properties (from detailed modelling)				
Main clusters or features of the current flood risk	Ickenham, Ruislip, Pinner			
Area of BAP (km)	1.2km^2 of BAP habitat (reedbed and floodplain grazing marsh)			
Floodplain area	3.4km^2 of floodplain. 40% of the floodplain is urban.			
Watercourse length	23km of which 2.5km is modified or artificial channel.			
Description of designated sites	None			
	Current responses to flood risk within the policy unit			
Total Maintenance Expenditure	**Approx 223**			
	Major Assets	**High Risk Systems**	**Low & medium Risk**	
Approx. Expenditure	13	210	0	
Where				
Purpose of Maintenance	Maintenance of existing defences and maintaining conveyance in urban areas.			
Approximate Standards of service that apply	2% AEP.			
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	40%		
	Detection Improvements: Site planned at Ruislip Flood Awareness Events: No specific activity planned Forecasting Improvements: No specific activity planned			

Opportunities & Constraints	Areas of the Pinn floodplain are within regeneration areas. A more sustainable balance between conveyance and attenuation within the catchment River restoration
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Additional defences are not considered viable in the foreseeable future. P6: We would be looking to implement this policy over the long-term when the existing defences are replaced so that there we achieve a degree of attenuation in the catchment. This could have positive impacts on environmental, social and economic indicators.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).
Justification (Balancing Objectives)	For the foreseeable future there will be very little change in the way we manage the probability of flooding in the Pinn policy unit. In the very long-term however, there are opportunities to alter our management so that it is more adaptable to the impacts of climate change. The policy selection has been made with this long-term view in mind. The implementation will start to come about when the existing defences come to be replaced. In the meantime we will focus on safeguarding the opportunities that exist and reducing the consequences of flooding. Over the next fifty years many of the defences that maintain the current 2% AEP standard of protection will come to the end of their useful life and decisions will need to be made on whether they are replaced like for like, replaced with a different form of defence or can be abandoned. The focus of the actions in the Pinn policy unit is;

	• To reduce the dependency upon the defences through adaptation of the urban environment through redevelopment. It is not expected that this redevelopment will eliminate the need for flood defences, but we do expect more of the buildings in the floodplain to be resilient and resistant to flooding. • In the Pinn we would like to have more attenuation within the catchment so that we are more resilient to climate change than would be the case by just relying on conveyance. At present there is a lot of open space within the floodplain and we are looking to safeguard this open space so that the opportunity to mitigate against the impacts of climate change by increasing attenuation remains. The proposed approach to policy implementation has many potential benefits that should prove to be sustainable (more open river corridors and more natural river channels where appropriate and effective use of open space in the catchment). Assets will need to be maintained where there is unlikely to be large scale regeneration. The policy selection reflects the potential of the policy unit, but implementation is uncertain at this stage, but is likely to be more viable in the future (20 to 30 years time) when the impacts of climate change are more defined. The presence of a perched water table in this policy unit means that the soil conditions offer the potential for supporting new wetland BAP habitat.
Key Actions (Developed in Action Plan)	**Pi1 Short-term planning actions** **Pi2 Long-term adaptation of the urban environment to be more flood resilient** **Pi3 Surface water drainage** **Pi4 Optimising attenuation and conveyance within the catchment in the long-term** **Pi5 Short-term management of assets**
Risks, Uncertainties & Dependencies	Implementation of the proposed approach to implementing policy in the Pinn is dependent upon; • Safeguarding open space • Adoption of appropriate policies within LDFs • Wider application of Making Space for Water principles (notably the use of open space in floodplains, flood resilience, urban drainage) • Evolution of the business to plan • Some funding for implementation.
Regional Priority (0-5yrs)	Medium. It is important to safeguard the opportunities to achieve sustainable flood risk management.

	Summary of the Preferred Approach					
Policy Unit	**Luton**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.6%**	of the economic consequences of fluvial flooding in Thames region				
	2.4%	of the social consequences of fluvial flooding in Thames region				
	0.1%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from			2104		2706	

flood zones)						
Properties (from MDSF)	155	308	760	1167		
Total Damages (£m from MDSF)	0.03	0.24	1.51	10.24		0.12
Projected Damages (£m)						0.19
Residential Damages						0.10
Commercial Damages						0.02
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	262	522	1174	1398		
Climate Change (Damages)	0.16	0.45	10.36	17.87		0.24
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	107	214	414	231		
Damages: Actual	0.14	0.20	8.84	7.63		0.12
Properties: % Change	69.0%	69.5%	54.5%	19.8%		
Damages: % Change	544.5%	83.2%	584.0%	74.5%		106.0%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-90.97%	-15.26%	-18.16%	-19.02%		
Damages (%)	-56.29%	-33.84%	-59.03%	-99.49%		-55.59%
	Impact of Scenario's on 1% AEP					
	-10% flows in Upper Lee	-5% flows in Upper Lee				
Properties: Actual	622	672				
Damages: Actual	0.62	0.87				
Properties: % Baseline change	-18.2%	-11.6%				
Damages: % Baseline change	-59.0%	-42.5%				
Main clusters or features of the current flood risk	North Luton including Houghton Brook					
Area of BAP (km)	None					
Floodplain area	2.1km^2 of floodplain. 65% of the floodplain is urban.					
Watercourse length	16km of which 4.5km is modified or artificial channel, including large sections of culvert.					

Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 176k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	4	172	0
Where			
Purpose of Maintenance	To maintain conveyance through Luton. This includes the removal of blockages and obstructions.		
Approximate Standards of service that apply	Typically, 2% AEP through the centre of Luton Locally, 10% to 2% AEP in residential areas affected by both fluvial and surface water flooding.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	10%	
	No specific activities planned		
Opportunities & Constraints	• To restore the river through Luton • To reduce the flood risk to people and property through flood storage • To restore the river corridor through the on-going cycle of redevelopment		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. This is so that the probability of flooding can be managed more sustainably and the consequences of flooding have been reduced. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Until there is greater space within the urban corridor, it will not be possible to construct new defences across most of this policy unit. P6: It is not viable to implement this policy in a meaningful way in this policy unit.		

Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	The current standard of protection through most of Luton is below national benchmark standards, but higher than in many other urban areas in the region. Luton is at the headwaters of the catchment and the watercourses are heavily modified. The results from the MDSF modelling in these locations need to be treated with caution. However, the indication from the modelling is that Luton is a particularly sensitive policy unit. Climate change has a large impact on damages; equally attenuating flows lead to a large reduction in damages (reducing flows by 10% lead to a 56% and 59% reduction in damages for a 10% AEP and 1% AEP flood respectively). Given this background and the level of risk (up to 2000 properties in a 1% AEP event), a policy that seeks to mitigate the impact of climate change and keep the level of risk to current levels is justified. Furthermore, there seem to be sustainable ways of achieving this by managing both the consequences and probability of flooding. If our approach is successful there will be a long-term reduction in the consequences of flooding linked to redevelopment in the floodplain through the centre of Luton. There are also options to reduce the probability of flooding in a sustainable way to some vulnerable locations. At present it is not certain whether these options are viable. An action is proposed to carry out an evaluation of these options so that this can be assessed. In an area of major development pressure, it is important to have further evidence to justify safeguarding potential flood storage areas. Taken as a whole a policy of maintaining flood risk at current levels in to the future (P4) is feasible, but it will be delivered through different approaches in the future. The approaches will have a net benefit to the environment (from river and river corridor restoration), though this is not the main driver for the proposed approach. Upstream of the town centre, there is the potential to reduce the probability of flooding through flood storage and localised flood defences. This would reduce the social and economic impacts of flooding.
Key Actions (Developed in Action Plan)	**Lu1 Land use planning - Short-term planning actions** **Lu2 Land use planning - Long-term adaptation of the urban environment to be more flood resilient** **Lu3 Flood Risk Management Strategy** **Lu4 Surface water drainage** **Lu5 Optimising attenuation and conveyance within the catchment in the long-term** **Lu6 Short-term management of assets** **Lu7 Flood warning, flood awareness and emergency planning**
Risks, Uncertainties & Dependencies	Delivery of the approaches proposed for Luton are dependent upon; • Reaching agreement at a strategic level on the vision for the redevelopment of the river corridor that meets the objectives of the Local Planning Authorities and sustainable flood risk management • Evolution of the business to be able to focus on delivering a more sustainable approach. • Safeguarding land through LDFs and SFRAs • Funding

	Further work is needed to refine the approach.
Regional Priority (0-5yrs)	High, recognising the need to safeguard land.

	Summary of the Preferred Approach					
Policy Unit	**Upper Lee**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.6%**	of the economic consequences of fluvial flooding in Thames region				
	0.4%	of the social consequences of fluvial flooding in Thames region				
	2.0%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			1039		1842	
Properties (from MDSF)	429	455	505	530		
Total Damages (£m from MDSF)	18.82	25.19	34.39	39.51		4.02
Projected Damages (£m)						6.09
Residential Damages						1.05
Commercial Damages						2.97
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	446	476	533	552		
Climate Change (Damages)	23.01	29.59	40.06	45.53		4.33
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	17	21	28	22		
Damages: Actual	4.19	4.39	5.66	6.02		0.31
Properties: % Change	4.0%	4.6%	5.5%	4.2%		
Damages: % Change	22.3%	17.4%	16.5%	15.2%		7.7%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-1.86%	-3.08%	-4.55%	-3.02%		
Damages (%)	107.21%	96.39%	124.80%	-80.81%		88.53%
	Impact of Scenario's on 1% AEP					
	-10% flows in Upper Lee	-5% flows in Upper Lee	100% storage - Rib	100% storage - Beane		
Properties:	482	493	478	392		

Actual						
Damages: Actual	31.43	33.02	27.00	30.68		
Properties: % Baseline change	4.6%	2.4%	5.3%	22.4%		
Damages: % Baseline change	8.6%	4.0%	21.5%	9.8%		

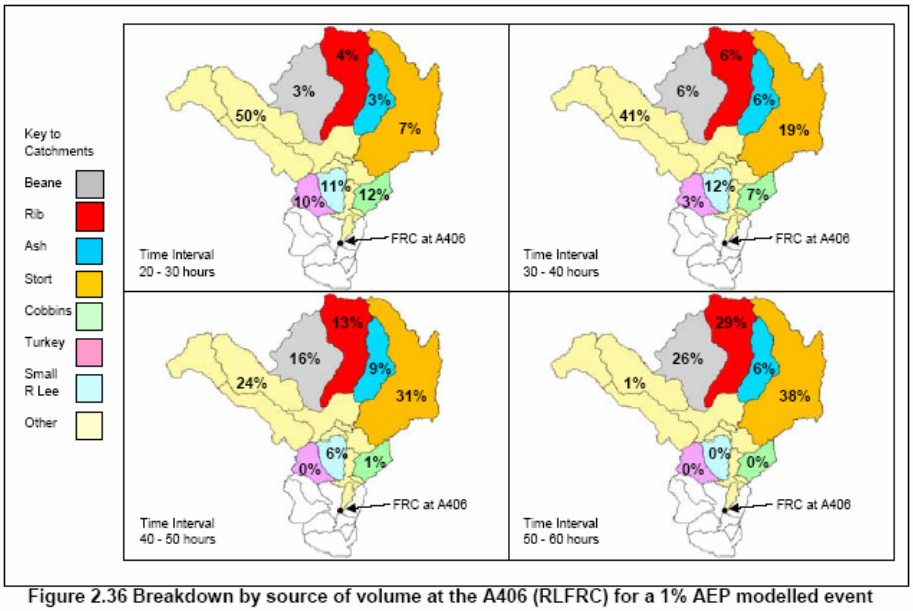
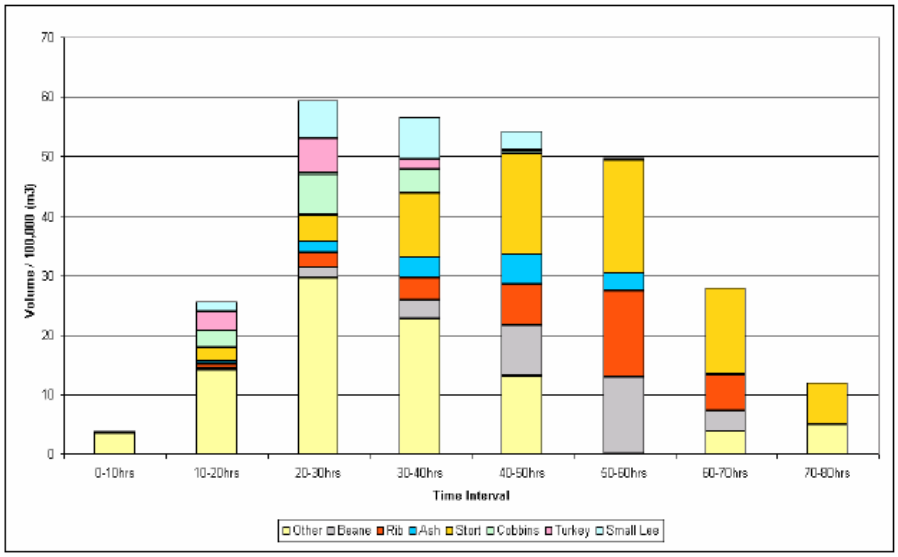
Main clusters or features of the current flood risk	Within the Upper Lee there are 1,040 properties at risk from a flood with a 1% AEP, which is less than 1% of all properties within the 1% AEP flood extent in Thames Region. The scale of flood risk at any one location is small in the regional context; typically there are less than 100 properties at risk of flooding in any one location. The Mimran, Ash and Rib catchments are predominantly rural tributaries, and flood risk to people and property is very dispersed.		
Area of BAP (km)	0.55km^2 of floodplain BAP habitat (predominantly floodplain grazing marsh with smaller areas of reedbed, fen and wet woodland).		
Floodplain area	17.3km^2 of floodplain. 11% of the floodplain is urban.		
Watercourse length	230km of which 13km is modified or artificial channel.		
Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 317k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	76	180	61
Where			
Purpose of Maintenance	Maintain conveyance in urban areas.		
Approximate Standards of service that apply	Typically 20% to 4% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	60%	
	Detection Improvements: No specific activity planned Flood Awareness Events: No specific activity planned Forecasting Improvements: Rainfall Runoff models to be delivered		
Opportunities & Constraints	There are no regionally significant, strategic scale, opportunities to manage flood risk in the Upper Lee and Upper Lee tributaries. Small scale river restoration in urban areas. In the very long-term there may be opportunities to remove culverts as part of any redevelopment taking place within Stevenage.		
Assessment of proposed approach (Against Economic,	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of		

Social and Environmental Indicators)	resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.
Policy	P3: Continue with existing or alternative actions to manage flood risk at the current level
Justification (Balancing Objectives)	The policy selection is based on the following; • Less than 1% of the economic and social risk across Thames region is in the Upper Lee • The impacts of climate change are relatively moderate. For example for a 1% AEP flood, the number of properties at risk under a climate change scenario increases only by approximately 5%. • Flood risk is quite dispersed; there is no single strategic solution to reduce the probability of flooding. • There are localities such as Wheathampstead where the risk of flooding is higher (below the national standard of protection). There may be a need to redistribute the use of resource within the policy unit to focus on some of these locations.
Key Actions (Developed in Action Plan)	**UL1 Land use planning** **UL2 Conveyance in urban locations** **UL3 Flood warning, flood awareness and emergency planning** **UL4 Flood Proofing and flood resilience to existing properties**
Risks, Uncertainties & Dependencies	The main uncertainties preventing the selection of a more aspirational policy for the Upper Lee are; • Flood resilience becoming part of the FRM tool kit • Future responsibilities for urban drainage • Funding
Regional Priority (0-5yrs)	Low for the next five years, recognising that in a regional context the levels of flood risk in the Upper Lee are low.

	Summary of the Preferred Approach					
Policy Unit	**Middle Lee & Stort**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**2.8%**	of the economic consequences of fluvial flooding in Thames region				
	1.1%	of the social consequences of fluvial flooding in Thames region				
	3.8%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			4524		6337	
Properties (from MDSF)	1209	1488	2213	2881		
Total Damages (£m from MDSF)	42.28	56.02	91.59	134.88		8.57
Projected Damages (£m)						12.95
Residential Damages						1.93
Commercial Damages						6.64
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	1382	1741	2905	3183		
Climate Change (Damages)	50.55	71.00	137.90	170.09		9.73
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	173	253	692	302		
Damages: Actual	8.27	14.99	46.30	35.21		1.16
Properties: % Change	14.3%	17.0%	31.3%	10.5%		
Damages: % Change	19.6%	26.8%	50.6%	26.1%		13.5%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-8.02%	-8.06%	-15.54%	-15.10%		
Damages (%)	-67.63%	21.45%	369.23%	-85.68%		125.41%
	Impact of Scenario's on 1% AEP					
	-10% flows in Upper Lee	100% storage - Stort	100% storage – Beam, Rib and Stort	100% storage - Rib		
Properties: Actual	1870	2033	1296	1717		
Damages: Actual	77.33	54.40	38.24	86.57		
Properties: % Baseline change	-15.5%	-8.1%	-41.4%	-22.4%		
Damages: %	-15.6%	-40.6%	-58.3%	-5.5%		

Baseline change						

Main clusters or features of the current flood risk	The main concentrations of flood risk within the policy unit are in Hertford, Ware and Bishops Stortford.		
Area of BAP (km)	4.9km^2 of BAP habitat (predominantly floodplain grazing marsh, reedbed and fen)		
Floodplain area	32km^2 of floodplain. 18% of the floodplain is urban.		
Watercourse length	258km of which 31km is maintained or modified channel.		
Description of designated sites	The Lee Valley Ramsar and SPA is made up of a number of SSSIs, including Amwell Quarry and Rye Meads. Amwell Quarry is a former gravel pit, comprising two large water bodies and a number of smaller wetland, grassland and woodland habitats. The site does not normally flood; however, the water levels are adjusted seasonally for the varying bird populations, which are of international importance. The hydrological conditions at Amwell Quarry are satisfactory and the aim is to maintain the current water level regime (levels, range and timing of variation within the site). The ecology of the fen meadows at Rye Meads reflects and depends on a high water table. The meadows and their ditches and ponds are groundwater dependent. They are considered to be in a satisfactory hydrological condition, but might benefit from additional winter inundation.		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 663k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	142	443	78
Where		Hertford, Ware	
Purpose of Maintenance	Maintenance of the capacity of the channel and assets in the lower reaches of the policy unit.		
Approximate Standards of service that apply	Quite a wide range in existing standards of protection. On the natural floodplain, flooding occurs regularly (50% AEP is typical). In urban areas, previous channel improvements result in a 10% AEP to 2% AEP being typical.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	38%	
	No specific activities planned		

Opportunities & Constraints	• Redevelopment within urban areas e.g. Bishops Stortford to reduce the consequences of flooding. • BAP creation within the natural floodplain • Natural floodplain attenuation within this policy unit reduces the risk downstream in the Lower Lee. This natural attenuation could be enhanced through more specific interventions to store water:  Figure 2.36 Breakdown by source of volume at the A406 (RLFRC) for a 1% AEP modelled event  The diagram above shows the contribution of the Lee tributaries to flood volumes in the Lower Lee. In a region wide flood event, the Stort can contribute over 30% of the volume of flood water in the later stages of a flood event. In general, the peak flow in the Lower Lee will be in the first part of a flood event (where the source is flow from the Lower Lee tributaries). As flood risk increases or the contribution from the wider Lee catchment increases (from climate change), some form of additional attenuation in the Middle Lee or Stort may become viable. At the moment this is not something that will consider in detail, but we will seek to preserve this future opportunity by safeguarding possible sites where attenuation could be carried out. All of these potential sites are in the Middle Lee and Stort policy unit.
Assessment of proposed	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as

approach (Against Economic, Social and Environmental Indicators)	natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).
Justification (Balancing Objectives)	The policy has been selected for the Middle Lee and Stort because it offers the most potential to; • Enhance and expand floodplain BAP habitat • Contribute in a small way to risk reduction to people and property downstream • Reduce flood risk to some people and property within the policy unit Large scale attenuation in the Middle Lee and Stort could reduce flood risk to approximately 500 to 1000 properties along the River Lee in the policy unit (notably in Ware) and downstream, particularly in the Lower Lee. However, within the Lower Lee, far bigger reductions in the probability of flooding can be achieved by attenuation in the Lower Lee tributaries policy unit. The policy is the right policy for this policy unit, but is likely to be a priority for implementation in the Lower Lee tributaries. The actions are designed to take some of the initial steps in meeting these objectives. The key features of the actions are; • maintaining and enhancing the capacity of the natural floodplain • safeguarding opportunities for future flood storage • re-establishing river corridors in urban areas • managing run-off from new development (e.g. Stanstead) Local flood defences that contribute to the policy overall and / or flood resilience may prove to be effective and sustainable in a few places (notably

	Hertford or Ware). If this is the case the policy unit boundary may need to be reviewed and sub-divided. At present there is not compelling evidence to do this. At present the hydrological regime of the water dependent designated sites in this policy unit is considered to be satisfactory. In the long-term, the selected policy and approach, may result in the capacity of the natural floodplain to retain water being increased. In theory this could balance some of the impacts of climate change. The hydrological regime of the designated sites is directly related to local conditions and local operations rather than overall policy at a catchment scale. There is almost 5km² of existing BAP habitat in the Middle Lee & Stort policy unit, which mainly consist of floodplain grazing marsh. There is potential to expand these sites and create new BAP habitat due to preferable current soil type, geology and environmental conditions. In the Stort catchment in particular, there is also fairly high potential for land management change which could bring flood risk benefits under P6.
Key Actions (Developed in Action Plan)	**ML1 Making Space for Water** **ML2 Efficient and effective targeting of maintenance** **ML3 Flood warning, flood awareness and emergency planning** **ML4 Short-term land use planning** **ML5 Long-term adaptation of the urban environment to be more flood resilient** **ML6 Safeguard future opportunities to reduce the probability of flooding in the future**
Risks, Uncertainties & Dependencies	Implementation of the proposed approach to implementing policy in the Middle Lee and Stort are dependent upon; • Safeguarding open space • Appropriate LDF policies and SFRA recommendations (particularly within the more urbanised areas) • Adoption of appropriate policies within LDFs • Wider application of Making Space for Water principles (notably the use of open space in floodplains, flood resilience and urban drainage) • The outcome of some more detailed investigations into the level of risk in some of the urban locations e.g. Hertford.
Regional Priority (0-5yrs)	Medium. It is important to safeguard the opportunities to achieve sustainable flood risk management.

	Summary of the Preferred Approach					
Policy Unit	**Lower Lee**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**13.7%**	of the economic consequences of fluvial flooding in Thames region				
	30.3%	of the social consequences of fluvial flooding in Thames region				
	7.4%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			30887		43260	
Properties (from MDSF)	4738	10291	21490	24694		

Total Damages (£m from MDSF)	23.05	141.95	841.58	1226.48		31.90
Projected Damages (£m)						41.61
Residential Damages						11.46
Commercial Damages						20.45
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	8936	16820	24928	26029		
Climate Change (Damages)	101.31	404.27	1268.28	1413.81		43.81
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	4198	6529	3438	1335		
Damages: Actual	78.26	262.33	426.70	187.34		11.91
Properties: % Change	88.6%	63.4%	16.0%	5.4%		
Damages: % Change	339.5%	184.8%	50.7%	15.3%		37.3%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-27.59%	-24.54%	-19.57%	-7.22%		
Damages (%)	-27.94%	-84.15%	-96.27%	-99.70%		-88.42%
	Impact of Scenario's on 1% AEP					
	100% storage – Pymmes Brook	100% storage – Salmons Brook	100% storage – Cobbins Brook			
Properties: Actual	14164	15499	19253			
Damages: Actual	444.01	498.46	620.89			
Properties: % Baseline change	34.1%	27.9%	10.4%			
Damages: % Baseline change	47.2%	40.8%	26.2%			
Main clusters or features of the current flood risk	There are clusters of properties at risk along the length of the Lower Lee with concentrations near the confluence with the Thames					
Area of BAP (km)	4.55km^2 of floodplain BAP habitat (predominantly floodplain grazing marsh)					
Floodplain area	46km^2 of floodplain. 59% of the floodplain is urban.					
Watercourse length	200km of which 85km is modified or artificial channel.					
Description of designated sites	Lee Valley SPA					

	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 952k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	319	632	1
Where	Defences and structures on the Lower Lee flood defences.		
Purpose of Maintenance	Maintenance of the Lower Lee defences		
Approximate Standards of service that apply	2% AEP. In some areas 4-3% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	9%	
	No specific activities planned		
Opportunities & Constraints	• To reduce the consequences of flooding through the on-going cycle of redevelopment. • To restore some parts of the river channel – for example by removing artificial bank lining. • To reduce the legacy cost and maintenance costs of structures in the Lower Lee.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Additional defences are not considered viable in the foreseeable future. P6: We would be looking to implement this policy over the long-term when the existing defences are replaced so that there we achieve a degree of attenuation in the catchment. This could have positive impacts on environmental, social and economic indicators.		
Policy	P5: Take further action to reduce flood risk		
Justification	The policy has been selected for the Lower Lee because;		

(Balancing Objectives)	• Over 10% of the economic consequences and over 30% of the social consequences of fluvial flooding in Thames region occur within this policy unit. • 74% of the properties at risk from flooding are in ED's with socially vulnerable populations. • Flooding can occur rapidly at the confluences of the Lower Lee and the Lower Lee tributaries. • There is a very high level of redevelopment within this policy unit. This means that there are tangible and realistic opportunities to reduce the consequences of flooding. • In the short-term the probability of flooding can be reduced to properties on some of the Lower Lee tributaries (specifically for Salmons Brook and Cobbins Brook). These schemes are designed to increase the attenuation in those catchments therefore having wider benefits for the whole of the Lower Lee. The capital cost of these schemes is in the order of £5m to £15m. • In the longer-term there are options to reduce the probability of flooding on some of the other tributaries (for example on the Ching Brook). However, there are economic uncertainties associated with these options. The actions focus upon maintaining the existing defences, reducing the probability of flooding on selected tributaries and reducing the consequences of flooding generally across the whole policy unit.
Key Actions (Developed in Action Plan)	**LL1 Short-term planning actions** **LL2 Long-term adaptation of the urban environment to be more flood resilient** **LL3 Lower Lee Flood Risk Management Strategy** **LL4 Flood warning, flood awareness and emergency planning** **LL5 Flood proofing and flood resilience to existing properties** **LL6 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	There are a range of uncertainties and dependencies associated with taking the selected policy forward • Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor that meets the objectives of the Local Planning Authorities and sustainable flood risk management and evolution of the business to be able to focus on delivering a more sustainable approach. • Maintaining the Lower Lee defences so that we are able to benefit from a further life cycle of the existing defences.
Regional Priority (0-5yrs)	High. It is important that planning future asset renewals starts in good time, recognising the potential consequences of a reduced standard of protection. Also, there is so much redevelopment taking place in the Lower Lee and it is important that this redevelopment contributes to risk reduction.

	Summary of the Preferred Approach	
Policy Unit	**Lower Lee tribs**	
	What is currently at risk from flooding: Problem / Risk	
Regional Context	**1.7%**	of the economic consequences of fluvial flooding in Thames region
	8.8%	of the social consequences of fluvial flooding in Thames region
	0.7%	of the floodplain, channel and designated environmental assets in

	Thames region					
	Current Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			2556		3077	
Properties (from MDSF)	1005	1878	5433	7751		
Total Damages (£m from MDSF)	22.51	43.03	122.17	224.81		7.91
Projected Damages (£m)						7.91
Residential Damages						3.15
Commercial Damages						4.76
	Future Risk: Economic and Social					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	1544	3371	8125	9308		
Climate Change (Damages)	38.27	63.85	243.03	308.55		10.49
	Difference between baseline and future					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	539	1493	2692	1557		
Damages: Actual	15.76	20.82	120.86	83.74		2.58
Properties: % Change	53.6%	79.5%	49.5%	20.1%		
Damages: % Change	70.0%	48.4%	98.9%	37.2%		32.5%
	Difference between baseline and reducing flow by 10%					
	10% AEP	**4% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-15.02%	-25.35%	-34.36%	-19.44%		
Damages (%)	-23.23%	-18.15%	-42.26%	-97.50%		-28.91%
	Impact of Scenario's on 1% AEP					
	100% storage - Stort	100% storage – Pymmes Brook	100% storage – Salmons Brook	100% storage – Cobbins Brook		
Properties: Actual	5038	3545	2910	4498		
Damages: Actual	113.84	90.95	89.97	90.03		
Properties: % Baseline change	-7.3%	-34.8%	-46.4%	-17.2%		
Damages: % Baseline change	-6.8%	-25.6%	-26.4%	-26.3%		
Main clusters or features of the current flood risk	Pymmes Brook, Nazeing Brook					

Area of BAP (km)	0.21km^2 of floodplain BAP habitat (predominantly wet woodland)		
Floodplain area	5.7km^2 of floodplain. 27% of the floodplain is urban.		
Watercourse length	96km of which 22km is modified or artificial channel.		
Description of designated sites	Wormley-Hoddesdon Park Woods SAC and Epping Forest SAC (neither are water-dependant)		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 361k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	20	310	31
Where		Mainly Pymmes, Cobbins, Salmons and Nazeing Brooks.	
Purpose of Maintenance	To maintain channel conveyance.		
Approximate Standards of service that apply	Highly variable. Typically in the range 5% to 2% AEP based on previous channel improvements.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	18%	
	Detection Improvements: Site planned at Chingford Flood Awareness Events: Flood Awareness evening (Aug 08) Forecasting Improvements: No specific activity planned		
Opportunities & Constraints	The main potential opportunities in this policy unit are; • Attenuation within the catchments to reduce flood risk locally and downstream at the confluence with the Lower Lee. • To naturalise the river where ever practical by removing culverts, trash screens, artificial bank and channel lining. • To reduce the legacy costs from the replacements of assets • Regeneration of areas to reduce flood risk		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this		

	policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. This is so that the probability of flooding can be managed more sustainably and the consequences of flooding have been reduced. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Until there is greater space within the urban corridor, it will not be possible to construct new defences across most of this policy unit.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).
Justification (Balancing Objectives)	The Lower Lee tributaries is a complex policy unit. The aim of the policy is to **reduce** risk to people and property within the policy unit and downstream in the Lower Lee. In time it is likely that this policy unit will be sub-divided to distinguish more precisely between; • Those parts of the policy unit where we are looking to explicitly apply the policy and attenuation flows, • Those parts of the policy unit a specific benefit from upstream or catchment attenuation will be derived, • Those tributaries where there will be a large benefit from attenuation and those where there will be a more modest benefit. At this stage, it is not possible to make these distinctions robustly and it would be disingenuous to do so. We can make the following statements however, • Modelling shows that attenuating flows in the Pymmes, Salmons and Cobbins Brook can lead to a significant reduction in the number of properties at risk in the downstream parts of these catchments close to the confluence with the River Lee (reducing flows by 10%, could reduce the risk to 780 properties in the Salmons Brook and 400 properties in the Pymmes Brook for a 1% AEP event). • There is also a positive effect from attenuating flows on the other tributaries, but the reductions are not as large (e.g. Turkey Brook and Ching Brook). • Reducing flows on the Lower Lee tributaries has a positive impact on the thousands of vulnerable properties at risk at the confluences with the River Lee and along the River Lee itself. In summary the policy is justified because of the level of risk, the interconnectivity between policy units and the potential does exist to implement the policy (albeit with many uncertainties): • **Level of risk** – 15% of the economic consequences of flooding and over 30% of the social consequences of flooding in Thames region can occur in the Lower Lee and Lower Lee tributaries. There are over 30,000 properties at risk. • **Interconnectivity -** The combination of manmade surfaces, steep catchments and clay soils means watercourses in the Lower Lee respond rapidly to rainfall and are liable to sudden flooding after storms. This has particularly adverse consequences for areas at the confluence of the lower Lee tributaries with the River Lee. The interconnectivity between the Lower Lee tributaries and the Lower Lee itself is a key factor in establishing future policy. • **Potential to attenuate flows -** There is the potential for engineered flood storage to reduce the risk of flooding to five key tributaries on the Lower

	Lee (Salmons, Cobbins, Pymmes, Nazeing and Ching Brooks). • **Environment:** P6 assumes that proposed storage options can progress enabling river restoration and BAP habitat creation. In the short-term, a number of opportunities have been identified for restoring river channel in the Lower Lee tributaries. This includes long sections of Pymmes Brook and also up to 200m of restored channel on both Salmon's Brook and Moselle Brook (involving some de-culverting). On the Ching there are opportunities for in-channel habitat enhancement.
Key Actions (Developed in Action Plan)	**LLT1 Short-term planning actions** **LLT2 Long-term adaptation of the urban environment to be more flood resilient** **LLT3 Lower Lee Flood Risk Management Strategy and options to reduce flood risk** **LLT4 Surface water drainage** **LLT5 Optimising attenuation and conveyance within the catchment in the long-term** **LLT6 Flood warning, flood awareness and emergency planning** **LLT7 Promoting the river as a community asset**
Risks, Uncertainties & Dependencies	Implementation of the proposed approach to implementing policy in the Lower Lee tributaries are dependent upon; • Safeguarding open space • Adoption of appropriate policies within Local Development Frameworks (LDFs) • Wider application of Making Space for Water principles (notably the use of open space in floodplains, flood resilience, urban drainage) • Funding criteria for storage options. • Evolution of the business
Regional Priority (0-5yrs)	High. Recognising the level of regeneration planned and interconnectivity with the Lower Lee.

	Summary of the Preferred Approach					
Policy Unit	**Middle Roding**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**1.9%**	of the economic consequences of fluvial flooding in Thames region				
	1.6%	of the social consequences of fluvial flooding in Thames region				
	0.3%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			5156		5958	
Properties (from MDSF)	10	129	2418			
Total Damages (£m from MDSF)	0.35	0.83	61.87			3.02
Projected Damages (£m)						4.63
Residential			54.68			

Damages						
Commercial Damages			7.19			
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	24	278	2784			
Climate Change (Damages)	0.55	3.34	105.49			4.97
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	14	149	366			
Damages: Actual	0.20	2.51	43.62			1.95
Properties: % Change	140.0%	115.5%	15.1%			
Damages: % Change	57.5%	300.7%	70.5%			64.6%
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-16.53%	-5.50%	-8.41%			
Damages (%)	-26.42%	-21.12%	-61.66%			
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						
Policy Unit	**Lower Roding**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.3%**	of the economic consequences of fluvial flooding in Thames region				
	5.1%	of the social consequences of fluvial flooding in Thames region				
	0.5%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			789		917	
Properties (from MDSF)	47	184	371			
Total Damages (£m from MDSF)	2.83	3.62	18.47			
Projected Damages (£m)						
Residential Damages			6.26			
Commercial			12.20			

Damages						
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	108	333	425			
Climate Change (Damages)	3.02	6.83	22.77			
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	61	149	54			
Damages: Actual	0.19	3.21	4.31			
Properties: % Change	129.8%	81.0%	14.6%			
Damages: % Change	6.8%	88.7%	23.3%			
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-60.00%	-45.74%	-29.11%			
Damages (%)	-2.54%	102.30%	-23.19%			

	Lower & Middle Roding		
Main clusters or features of the current flood risk	East Ham, Barking, Ilford (Loxford Water)		
Area of BAP (km)	Approximately 2 km² of floodplain grazing marsh		
Floodplain area	8.6km². Approximately 60% is urban.		
Watercourse length	29km of channel of which approximately 13km is maintained or modified channel		
Description of designated sites	None		
	Current responses to flood risk within the policy unit		
	Approx 537k		
Total Maintenance Expenditure	**Major Assets**	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	210	287	0
Purpose of Maintenance	Maintenance of existing defences in the Lower Roding. It is estimated that the existing defences have a residual life of about 20 years.		
Approximate Standards of service that apply	3% to 2% AEP. Locally 1% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	22%	
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood Awareness stand at local event (Jul 08) Forecasting Improvements: No specific activity planned		
Opportunities & Constraints	Development pressure (with the potential to increase risk) and floodplain redevelopment (with the potential to reduce risk)		

	Upstream flood storage to reduce the probability of fluvial flooding There are major constraints to reducing the probability of flooding to those areas at risk from tidal and fluvial flooding.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Additional defences are not considered viable in the foreseeable future. P6: We would be looking to implement this policy over the long-term when the existing defences are replaced so that there we achieve a degree of attenuation in the catchment. This could have positive impacts on environmental, social and economic indicators.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	There are over 5000 properties at risk in the Lower and Middle Roding. Most of these properties are protected to a moderate standard (3% to 2% AEP) from fluvial flooding. There is also a growing risk from surface water flooding and in the more extreme floods from combined tidal and fluvial flooding. Most of the properties at risk are in ED's with socially vulnerable populations. The Lower and Middle Roding is therefore vulnerable to a fluvial event more severe than a 2% AEP. The approaches proposed to manage the flood risk into the are broadly sustainable. They focus on attenuation upstream (action LR4) and reducing the consequences of flooding through the land use planning system (LR1 and LR2). Implementing attenuation approaches in the upstream policy unit is technically feasible and could have some wider environmental benefits for the floodplain BAP habitat. The estimated cost of engineered flood storage to reduce the risk from fluvial flooding is £4m to £8m. There is some uncertainty over the economic justification for these options at present. However, the existing defences have a residual life of 20 years. Maintaining the standard through flood storage rather than simply replacing the existing defences like for like has a number of benefits:

	1. It more adaptable to the impacts of climate change because the capacity of the storage areas can be increased. 2. Storage will reduce the risks from combined tidal and fluvial flooding. We are therefore confident that the approach is more sustainable and the main uncertainty relates to the timing of progressing these options.
Key Actions (Developed in Action Plan)	**LR1 Short-term planning actions** **LR2 Long-term adaptation of the urban environment to be more flood resilient** **LR3 Surface water drainage** **LR4 Roding Flood Risk Management Strategy** **LR5 Short-term management of assets** **LR6 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	Dependent upon; • Reaching agreement at a strategic level on the vision for the redevelopment within the floodplain and location of new development and evolution of the business to manage this. • Partnership (for example, to manage the risks from surface water flooding). • Upstream flood storage
Regional Priority (0-5yrs)	High. The right intervention through the planning system now will reduce our dependency on existing flood defences.

	Summary of the Preferred Approach					
Policy Unit	**Upper Roding**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**1.1%**	of the economic consequences of fluvial flooding in Thames region				
	1.6%	of the social consequences of fluvial flooding in Thames region				
	1.3%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			2177		2819	
Properties (from MDSF)	599	1200	1629			
Total Damages (£m from MDSF)	7.34	20.02	48.45			
Projected Damages (£m)						
Residential Damages			30.39			
Commercial Damages			18.06			
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	926	1385	1763			
Climate Change	12.75	31.05	61.47			

(Damages)						
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	327	185	134			
Damages: Actual	5.41	11.03	13.02			
Properties: % Change						
Damages: % Change	54.6%	15.4%	8.2%			
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-39.73%	0.72%	-8.55%			
Damages (%)	-23.42%	-19.33%	-16.39%			
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						

Main clusters or features of the current flood risk	The Upper Roding is predominantly a natural river system, flowing through undeveloped countryside. The properties at risk of flooding are generally widely dispersed. Flood storage on the Cripsey Brook and raised floodbanks currently reduce the probability of flooding to some urban areas.		
Area of BAP (km)	Approximately 1km^2 of BAP habitat (predominantly floodplain grazing marsh)		
Floodplain area	20km^2 of floodplain of which over 80% is rural		
Watercourse length	122km of which approximately 5km is maintained or modified channel		
Description of designated sites	Epping Forest SAC (not water-dependant)		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 426k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	32	394	0
Where	Loughton Brook		
Purpose of Maintenance	To maintain existing flood storage areas and maintain conveyance in urban areas.		
Approximate Standards of service that apply	Quite a wide range in existing standards of protection. On the natural floodplain, flooding occurs regularly (50% AEP is typical). In urban areas, previous channel improvements result in a 10% AEP to 2% AEP being typical.		
Flood Warning	Proportion signed-up to FWD	30%	

(activities planned in 2008-09)	Detection Improvements: Site planned at Abridge Flood Awareness Events: No specific activity planned Forecasting Improvements: No specific activity planned
Opportunities & Constraints	Flood attenuation BAP creation Maintaining or perhaps enhancing the capacity of the natural floodplain to retain water.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators. Generally there may be some increase in the length of natural channel as natural processes dominate. P2: Increase in risks to social and economic indicators. Some redistribution of resources within the policy unit could moderate these impacts. Generally there may be some increase in the length of natural channel as natural processes dominate. There is no real increase in the area of BAP habitat as this does require intervention. P3: Risks to social and economic indicators increase in line with the impacts of climate change. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will be very difficult and could prove expensive and have negative impacts on the area of BAP habitat and opportunity to restore rivers. In general the policy would require interventions to reduce the consequences of flooding; mainly flood warning because rates of redevelopment are quite low. P5: This policy would require either resilience to become widely adopted or a large increase in capital expenditure to increase the standard of protection – this would not be viable everywhere. The impact on environmental indicators would be neutral providing any defences compensated for any habitat loss. P6: This policy can be implemented in ways to have a positive impact on environmental, social and economic indicators. To reduce risk to people and property will require large scale interventions.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction, e.g. for habitat inundation).
Justification (Balancing Objectives)	The policy has been selected for the Upper Roding because; • Maintaining or enhancing the capacity of the natural floodplain to retain water will contribute to managing risk within the policy unit (e.g. in Chipping Ongar and Woodford) • Attenuating 10% of the flow in the Upper Roding has the potential to reduce flood damages in the Lower and Middle Roding by 23% and 60% for a 1% AEP event respectively. • Increases the potential to expand or enhance existing floodplain BAP habitat. The characteristics of the Upper Roding floodplain i.e. the potential to enhance the environment and reduce the risk of flooding to downstream urban areas have been the basis for policy selection. To significantly reduce

	the downstream flood risk through attenuation, major-engineered storage would be required. Potentially viable flood storage areas have been identified at Shonks Mill, however, it is not certain whether these can be progressed in the near future. In the meantime, alterations to the maintenance regime do have the potential to reduce flood risk locally and provide the potential to enhance floodplain habitat, including BAP. This policy has the greatest potential to create new areas of wetland BAP habitat. In the lower and middle reaches of the Upper Roding policy unit the soil type, geology and environmental conditions are appropriate to support new wetland habitats (e.g. high groundwater table). In the upstream reaches, there is some potential for both land-use and land-management change to provide some benefit in the reduction of flood risk, for example through the creation of flood storage areas. The actions are designed to start to investigate all of these opportunities.
Key Actions (Developed in Action Plan)	**UR1 Maintain existing flood storage areas and the associated urban conveyance** **UR2 Making Space for Water** **UR3 Review the effectiveness of maintenance** **UR4 Flood warning, flood awareness and emergency planning** **UR5 Land use planning** **UR6 Flood proofing and flood resilience to existing properties** **UR7 Surface water drainage**
Risks, Uncertainties & Dependencies	Dependent on the application of Making Space for Water principles (floodplain management, resilience and resistance measures) for a significant change. Dependent upon successful application of the sequential test, community engagement and acceptance of flood risk for an evolutionary change.
Regional Priority (0-5yrs)	Low.

	Summary of the Preferred Approach					
Policy Unit	**Beam**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**0.9%**	of the economic consequences of fluvial flooding in Thames region				
	0.6%	of the social consequences of fluvial flooding in Thames region				
	0.1%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			1759		2442	
Properties (from MDSF)	146	277	421			
Total Damages (£m from MDSF)	1.91	3.68	6.80			0.70
Projected Damages (£m)						1.23
Residential Damages			6.27			
Commercial			0.53			

Damages						
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	186	337	576			
Climate Change (Damages)	2.13	4.71	11.51			0.95
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	40	60	155			
Damages: Actual	0.22	1.04	4.71			0.25
Properties: % Change	27.4%	21.7%	36.8%			
Damages: % Change	11.6%	28.2%	69.2%			35.7%
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-19.54%	-25.03%	-8.49%			
Damages (%)	-7.98%	-12.99%	-17.29%			-14.29%
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						

Main clusters or features of the current flood risk	Romford
Area of BAP (km)	Very small area of wet woodland
Floodplain area	3.2km² of which just over half is rural
Watercourse length	11km of which approximately 3km is maintained channel
Description of designated sites	None
	Current responses to flood risk within the policy unit
Total Maintenance Expenditure	**Approx 200k**

	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	0	200k	0
Where		Washlands FSA Romford	

Purpose of Maintenance	To maintain channel conveyance and to maintain numerous structures in the policy unit. Removal of blockages that can cause flooding.	
Approximate Standards of service that apply	Typically 2% AEP.	
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	40%
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood Awareness stand at local event (May 08) Forecasting Improvements: No specific activity planned	
Opportunities & Constraints	Redevelopment of the river corridor through Romford.	
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Additional defences are not considered viable in the foreseeable future. P6: We would be looking to implement this policy over the long-term when the existing defences are replaced so that there we achieve a degree of attenuation in the catchment. This could have positive impacts on environmental, social and economic indicators.	
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).	
Justification (Balancing Objectives)	The policies are aimed at reducing the consequences of flooding against a background of the increased probability of flooding from climate change. Based on the current drivers for flood risk management, the large scale growth and regeneration planned, this is a sensitive policy unit. Climate change will mean there is a long-term reduction in standard of protection from the existing defences. Taken as a whole a policy of maintaining flood risk at current levels in to the future (P4) is achievable and realistic. Achieving this policy is highly dependent on being able to take forward the Spatial Planning	

	actions identified. The policy has been selected for the Beam because; • There are over 1,700 properties at risk in a 1% AEP flood event. • There is a moderate standard of protection from flooding. • There are limitations in our ability to reduce the probability of flooding in the short-term; these make the selection of P5 unrealistic. • There is a lot of redevelopment taking place in this policy unit. • Modelling indicates that the impacts of climate change will be moderate in the Beam for the more frequent flood events, but more significant for the more extreme events, notably the 1% AEP event. • Modelling also indicates that attenuating water in this policy unit will have a limited impact on the number of properties at risk and flood damages. • Reducing the consequences of flooding through redevelopment may offset these climate change impacts for fluvial flooding. The potential change in the area of BAP habitat has not been considered in this appraisal. The majority of the habitat is located partially within the tidal floodplain and the outcome of the TE2100 project will have a much stronger impact on the existing habitat. If our approach is successful there will be a reduction in flood risk from redevelopment. Climate change will mean there is a long-term reduction in standard of protection. Taken as a whole a policy of maintaining flood risk at current levels in to the future (P4) is achievable and realistic. Achieving this policy is highly dependent on being able to take forward the Spatial Planning actions identified. The actions focus on short-term steps to increase the resilience of the urban floodplain through redevelopment.
Key Actions (Developed in Action Plan)	**Bm1 Land use planning - Short-term planning actions** **Bm2 Long-term adaptation of the urban environment to be more flood resilient** **Bm3 Surface water drainage** **Bm4 Optimising attenuation and conveyance within the catchment in the long-term** **Bm5 Short-term management of assets** **Bm6 Maintain the Washlands Flood Storage Area** **Bm7 Tidal / Fluvial overlaps**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor and location of new development and evolution of the business.
Regional Priority (0-5yrs)	High. The right intervention through the planning system now will reduce our dependency on existing flood defences and the associated long-term maintenance and replacement costs.

	Summary of the Preferred Approach	
Policy Unit	**Ingrebourne**	
	What is currently at risk from flooding: Problem / Risk	
Regional Context	**0.4%**	of the economic consequences of fluvial flooding in Thames region
	0.1%	of the social consequences of fluvial flooding in Thames region
	1.7%	of the floodplain, channel and designated environmental assets in Thames region
	Current Risk: Economic and Social	

	20% AEP	5% AEP	1% AEP	0.5% AEP	0.1% AEP	AAD
Properties (from flood zones)			398		693	
Properties (from MDSF)	302	807	1095			
Total Damages (£m from MDSF)	5.77	38.86	108.23			5.97
Projected Damages (£m)						5.97
Residential Damages			11.86			
Commercial Damages			96.37			
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	400	894	1163			
Climate Change (Damages)	8.91	61.50	137.12			8.21
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	98	87	68			
Damages: Actual	3.14	22.64	28.89			2.24
Properties: % Change	32.5%	10.8%	6.2%			
Damages: % Change	54.4%	58.3%	26.7%			37.5%
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-9.30%	-7.67%	-7.89%			
Damages (%)	-17.04%	-23.50%	-21.37%			-19.93%
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						
Main clusters or features of the current flood risk	Along most of its course the River Ingrebourne flows through undeveloped areas in a semi-natural channel. The key areas of flood risk are in towards the headwaters of the catchment in Brentwood and close to the River Thames at Rainham. Over 400 properties are at risk directly from fluvial flooding, but over 2000 are at risk from tidal or combined tidal and fluvial flooding. Sea-level rise will increase risks from combined tidal / fluvial flood events in the lower reaches.					
Area of BAP (km)	4.4km^2 of BAP habitat within the floodplain (mainly floodplain grazing marsh)					

Floodplain area	6.6km² of floodplain, 20% is urban		
Watercourse length	42km of which approximately 2km is maintained channel		
Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 580k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	215	361	4
Where			
Purpose of Maintenance	Maintenance of existing defences and maintaining conveyance in urban locations		
Approximate Standards of service that apply	Typically 5% to 2% AEP		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	23%	
	No specific activities planned		
Opportunities & Constraints	All of the drivers in this policy unit can lead to an increased flood risk; • Sea-level rise • More frequent and more intense rainfall • Thames Gateway development There are sites within this policy unit that could make a significant contribution to reducing the risk of tidal flooding locally and within the estuary as a whole. It is vital that these are safeguarded. This will help to manage the impacts of sea-level rise. The Thames Gateway development is being progressed to meet the wider needs to grow and sustain communities. It is imperative that flood risk management considerations are part of the planning for these communities.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a large increase in risks to economic and social indicators as the condition of modified watercourses deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration of modified watercourses. Reductions in Development Control activity in this policy unit could also lead to an increase in inappropriate development in the floodplain as there is a lot of growth planned. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels.		

	Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience, removing restrictions to flow or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from new defences. P6: Attenuation can reduce the risk to some people and property within the policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	The probability of flooding will increase in this policy unit; in the lower reaches because of sea-level rise and elsewhere from more intense rainfall and increased urban run-off. There is nothing that can be done to change this. The focus of this policy is to adapt to these changing circumstances, recognising that it is an area of growth. Site new development in areas of lowest risk, adaptation of urban river corridors and an increasing focus on urban drainage. The policy is sustainable because it is aimed at adapting to a changing level of risk, recognising that this is a policy unit where the total risk is moderate (in a regional and national context).
Key Actions (Developed in Action Plan)	**In1 Short-term planning actions** **In2 Long-term adaptation of the urban environment to be more flood resilient** **In3 Surface water drainage** **In4 Maintain current levels of defence** **In5 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	Dependent upon; • Safeguarding sites for future flood storage • The location of new development in the policy unit • Outcomes from the TE2100 project • Agreeing at a strategic level with local authorities how flood risk considerations and wider growth considerations are balanced to achieve the objectives of both. • Future approaches to urban drainage and urban run-off.
Regional Priority (0-5yrs)	High. Recognising the current drivers in this policy unit.

	Summary of the Preferred Approach					
Policy Unit	**Ravensbourne**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**5.0%**	of the economic consequences of fluvial flooding in Thames region				
	6.6%	of the social consequences of fluvial flooding in Thames region				
	0.4%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			9461		15431	
Properties (from	3461	4679	6575			

MDSF)						
Total Damages (£m from MDSF)	53.06	102.63	194.14			17.41
Projected Damages (£m)						22.72
Residential Damages			94.37			
Commercial Damages			99.77			
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	4148	5345	7639			
Climate Change (Damages)	72.40	132.45	246.62			28.53
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	687	666	1064			
Damages: Actual	19.34	29.82	52.48			5.12
Properties: % Change	19.8%	14.2%	16.2%			
Damages: % Change	36.4%	29.1%	27.0%			29.4%
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-11.11%	-10.56%	-12.78%			
Damages (%)	-14.41%	-16.10%	-15.12%			-15.39%
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						
Main clusters or features of the current flood risk	Properties at risk along all the river in this policy unit					
Area of BAP (km)	0.21km^2 of wet woodland towards the headwaters of the policy unit.					
Floodplain area	11.1km^2 of floodplain. 85% of the floodplain is urban.					
Watercourse length	69km of which 35km is modified or artificial channel. Large sections of culvert throughout the catchment.					
Description of designated sites	None					
	Current responses to flood risk within the policy unit					

Total Maintenance Expenditure	**Approx 607k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	21	586	0
Where			
Purpose of Maintenance	To maintain channel conveyance and to maintain numerous structures in the policy unit. Removal of blockages that can cause flooding.		
Approximate Standards of service that apply	Typically 5% AEP, locally up to 1% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	3%	
	Detection Improvements: No specific activity planned Flood Awareness Events: No specific activity planned Forecasting Improvements: Hydrodynamic model to be delivered		
Opportunities & Constraints	Effective future use of the many existing open spaces in the urban river corridor, linked to redevelopment of the urban area can provide the opportunity to redefine a more sustainable balance between conveyance and attenuation within the Ravensbourne. Sustainable because it could reduce our dependence on the current assets and therefore reducing long-term costs, and increase the potential for river restoration. A key constraint with this approach is that whilst it will deliver long-tem benefits (to all indicators), it may mean that some shorter-term measures to reduce the probability are not taken forward. If they do contribute to the overall approach (as at Deptford for example), then there is no reason why they cannot be progressed – but these types of option (e.g. to utilise open space for flood risk management) are not necessarily those that are most beneficial against current funding criteria.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. This is so that the probability of flooding can be managed more sustainably and the consequences of flooding have been reduced. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional		

	defences. Until there is greater space within the urban corridor, it will not be possible to construct new defences across most of this policy unit. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	The most effective and sustainable approach to managing risk in the long-term is to change the character of the urban floodplain. In the long-term this provides the opportunity to link our management of the watercourse (channel, structures), floodplain (open space) to the redevelopment of the urban river corridor. This approach – if it proves to be possible to implement – would have a positive impact on social and economic indicators. It would also provide the potential to have a positive impact on environmental indicators. The level of flood risk in the Ravensbourne policy unit is significant at a regional scale (with approximately 5% of the economic and social consequences of fluvial flooding in Thames region). If our approach is successful there will be a long-term reduction in the consequences of flooding linked to redevelopment in the floodplain. There are options to reduce the probability of flooding in a sustainable way to some vulnerable locations, but climate change will mean there is a long-term increase in the probability of flooding in most places. If the opportunities to reduce the consequences of flooding are not taken flood risk will continue to increase and unsustainable approaches will need to continue. With climate change the expected increase in flood damages is in the order of 36% for the more frequent floods (20% AEP) and 27% for the more severe floods (1% AEP). Taken as a whole a policy of maintaining flood risk at current levels in to the future (P4) is realistic, but it will be delivered through different approaches in the future. The approaches will have a net benefit to the environment (from river and river corridor restoration), though this is not the main driver for the proposed approach. For P4, to accommodate the impacts of climate change we have assumed that 20% of the existing urban floodplain corridor is redeveloped to be resilient to flooding and with a layout taking account of flood risk, small reductions in the current rates of run-off have been achieved. Flood defences that also enhance the quality of the river corridor have been implemented. In the short-term, a number of opportunities have been identified for restoring river channel in the Ravensbourne policy unit. These include Lewisham town centre, Ladywell Fields, Cator Park and Queensmead, which together could create over 2km of restored river channel. The policy should be kept under review. P5 or P6 may be viable in the future as the criteria for flood risk management investment evolve. Broad scale modelling indicates that utilising the available open space within the middle and lower areas of the catchment for flood storage could reduce Annual Average Damages in the order of 10% to 15%. The approaches described under P6 may become viable in the future. The actions focus on short-term steps to increase the resilience of the urban floodplain through redevelopment, progress sustainable schemes at the most vulnerable locations and start to investigate what the precise benefits would be from achieving more attenuation in the floodplain.

Key Actions (Developed in Action Plan)	**Ra1 Short-term planning actions** **Ra2 Long-term adaptation of the urban environment to be more flood resilient** **Ra3 Surface water drainage** **Ra4 Optimising attenuation and conveyance within the catchment in the long-term** **Ra5 Short-term management of assets** **Ra6 Flood Alleviation Schemes** **Ra7 Flood warning, flood awareness and emergency planning** **Ra8 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor that meets the objectives of the Local Planning Authorities and sustainable flood risk management and evolution of the business to be able to focus on delivering a more sustainable approach. Further work is needed to refine the approach.
Regional Priority (0-5yrs)	Very High. It is essential that the opportunities afforded by major redevelopment in the Lower and Middle parts of the catchment are taken. A Spatial Delivery plan linked to future asset management planning is required and then the business needs to evolve to deliver.

	Summary of the Preferred Approach					
Policy Unit	**Graveney**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**1.4%**	of the economic consequences of fluvial flooding in Thames region				
	1.1%	of the social consequences of fluvial flooding in Thames region				
	0.1%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			4277		6000	
Properties (from MDSF)	2213	3063	3899			
Total Damages (£m from MDSF)	19.06	45.73	84.11			7.84
Projected Damages (£m)						8.53
Residential Damages			53.60			
Commercial Damages			30.51			
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	2580	3426	4242			
Climate Change (Damages)	27.94	58.35	102.11			10.11
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	367	363	343			
Damages:	8.88	12.62	18.00			2.27

Actual						
Properties: % Change	16.6%	11.9%	8.8%			
Damages: % Change	46.6%	27.6%	21.4%			26.9%
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	0.00%	-14.13%	-6.47%			
Damages (%)	-27.17%	-15.43%	-10.15%			
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						

Main clusters or features of the current flood risk	There are properties at risk all along the length of the River Graveney		
Area of BAP (km)	None		
Floodplain area	1.7km^2 of floodplain. 85% of the floodplain is urban.		
Watercourse length	9km of channel. Almost all of the channel is artificial or has been modified.		
Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 75k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	0	75	0
Where		Throughout the policy unit.	
Purpose of Maintenance	Maintaining conveyance, including the removal of obstructions and blockages.		
Approximate Standards of service that apply	Typically 2% AEP		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	3%	
	No specific activities planned		

Opportunities & Constraints	The constraints in this catchment are so acute, that the options that are available to manage flood risk have only a limited impact in the short to medium term. The key constraints include; • residential and industrial development adjacent to the river • residential areas are well established so there are few opportunities to reduce the consequences of flooding through redevelopment • a continuous and straightened concrete lined river channel • fly-tipping and very little open space in the river corridor • There are at present a few locations where there are opportunities to restore the river and its associated floodplain and reduce flood risk The main opportunities to open up and restore the river and perhaps gain some attenuation within the catchment are at Norbury Park.
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. This is so that the probability of flooding can be managed more sustainably and the consequences of flooding have been reduced. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Until there is greater space within the urban corridor, it will not be possible to construct new defences across most of this policy unit. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change)
Justification (Balancing Objectives)	Policy selection in the Graveney policy unit is complicated because there is a large difference in what we would like to achieve and what can realistically be achieved in the short to medium term. The P4 policy has been selected because; • The current standard of protection in the Graveney is moderate by national standards, but there is protection against the most frequent fluvial floods. • With over 4000 properties at risk from flooding it would not be proportional to reduce the current level of protection, recognising that

	there are very real limitations in our scope to reduce the consequences of flooding. • The existing constraints do mean that it is unrealistic to set a policy that seeks to reduce risk. The actions focus on continuing with existing approaches to flood risk management (maintaining conveyance, flood warning, enforcement, application of PPS25). There is the possibility of restoring part of the River Graveney and providing some attenuation or flood storage at Norbury Park in the upper part of the catchment and this will be investigated through the action plan. At present the outcome of these investigations is uncertain. If we are able to implement these approaches at Norbury Park, it is likely that we would need to do less elsewhere in the catchment to maintain the risk at current levels. These investigations are therefore justified under a P4 policy as our view is that if they are successful, there would be a change in the balance of activity in the catchment rather than a change in the amount of activity.
Key Actions (Developed in Action Plan)	**Gr1 Short-term planning actions** **Gr2 Surface water drainage** **Gr3 Maintaining conveyance and where practical increase its efficiency** **Gr4 Flood Proofing and flood resilience to existing properties** **Gr5 Flood warning, flood awareness and emergency planning**
Risks, Uncertainties & Dependencies	None
Regional Priority (0-5yrs)	Low. Recognising the existing constraints, we will continue with current maintenance, removing obstructions and enforcement.

	Summary of the Preferred Approach					
Policy Unit	**Wandle**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**4.7%**	of the economic consequences of fluvial flooding in Thames region				
	4.5%	of the social consequences of fluvial flooding in Thames region				
	0.3%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			11698		12372	
Properties (from MDSF)	3301	4721	6215			
Total Damages (£m from MDSF)	208.34	279.94	423.74			27.96
Projected Damages (£m)						41.07
Residential Damages			61.53			
Commercial Damages			362.21			
	Future Risk: Economic and Social					

	20% AEP	5% AEP	1% AEP	0.5% AEP	0.1% AEP	AAD
Climate Change (Properties)	3967	5544	6881			
Climate Change (Damages)	230.85	353.58	505.68			36.55
	Difference between baseline and future					
	20% AEP	5% AEP	1% AEP	0.5% AEP	0.1% AEP	AAD
Properties: Actual	666	823	666			
Damages: Actual	22.51	73.64	81.94			8.59
Properties: % Change	20.2%	17.4%	10.7%			
Damages: % Change	10.8%	26.3%	19.3%			30.7%
	Difference between baseline and reducing flow by 10%					
	20% AEP	5% AEP	1% AEP	0.5% AEP	0.1% AEP	AAD
Properties (%)	-16.18%	-6.40%	-4.21%			
Damages (%)	-5.26%	-12.74%	-10.85%			
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						

Main clusters or features of the current flood risk	There are properties at risk all along the watercourses in this policy unit
Area of BAP (km)	None
Floodplain area	6.7km^2 of floodplain. 75% of the floodplain is urban.
Watercourse length	39km of which approximately 30km is in a natural or semi natural condition where modifications have been relatively minor.
Description of designated sites	None
	Current responses to flood risk within the policy unit
Total Maintenance Expenditure	**Approx 239k**

	Major Assets	High Risk Systems	Low & medium Risk
Approx. Expenditure	24	215	0
Where			

Purpose of Maintenance	Maintain conveyance in urban areas.
Approximate	Typically 5% to 2% AEP

Standards of service that apply		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	13%
	Detection Improvements: No specific activity planned Flood Awareness Events: Flood week (Mar 09) Forecasting Improvements: No specific activity planned	
Opportunities & Constraints	Effective future use of the many existing open spaces in the urban river corridor, linked to redevelopment of the urban area can provide the opportunity to redefine a more sustainable balance between conveyance and attenuation within the Wandle. Sustainable because it could reduce (albeit in a small way) our dependence on the current assets and therefore reducing long-term costs, and increase the potential for river restoration. A key constraint with this approach is that whilst it will deliver long-tem benefits (to all indicators), it may mean that some shorter-term measures to reduce the probability are not taken forward. If they do contribute to the overall approach, then there is no reason why they cannot be progressed – but these types of option (e.g. to utilise open space for flood risk management) are not necessarily those that are most beneficial against current funding criteria.	
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Additional defences are not considered viable in the foreseeable future. P6: We would be looking to implement this policy over the long-term when the existing defences are replaced so that there we achieve a degree of attenuation in the catchment. This could have positive impacts on environmental, social and economic indicators.	
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).	
Justification (Balancing	The policy could potentially be achieved in many ways. The most effective and sustainable in the long-term are to link our management of the	

Objectives)	watercourse (channel, structures), floodplain (open space) to the redevelopment of the urban river corridor. Spatial Planning and Asset Management are key to this approach. This approach – if it proves to be possible to implement – would have a positive impact on all indicators. The policy has been selected for the Wandle because; • Approximately 5% of the economic and social consequences from fluvial flooding in Thames region could occur in the Wandle. • There are over 10,000 properties at risk in a 1% AEP flood event. • Standards of protection are reasonable by Thames region standards, but low in terms of national standards. • There are limitations in our ability to reduce the probability of flooding in the short-term; these make the selection of P5 unrealistic. • There is a lot of redevelopment taking place in this policy unit. Modelling indicates that the impacts of climate change will be moderate in the Wandle. Reducing the consequences of flooding through redevelopment may be able to offset these climate change impacts for fluvial flooding. If our approach is successful there will be a reduction in flood risk from redevelopment. Climate change will mean there is a long-term reduction in standard of protection. There is the potential in this policy unit to accommodate increases in the probability of flooding – providing open space in the floodplain is safeguarded and ultimately adapted for flood risk management purposes. Taken as a whole a policy of maintaining flood risk at current levels in to the future (P4) is realistic, but it will be delivered through different approaches in the future. There are large potential environmental gains in the Wandle policy unit. Much of the watercourse flows through open space with the potential to reduce the dependency on engineered river banks. The potential gains are uncertain, but they are real. Under this policy option, the length of restored channel and area of BAP wetland habitat is likely to increase as policies such as the South London River Restoration strategy and PPS25 are implemented. In the short-term, a number of opportunities have been identified for restoring river channel in the Wandle policy unit. These include Beddington Farmlands, King George's Park and Wandle Park which together could create almost 3km of restored river channel. There is the potential to evolve to the approaches defined in P6 at some time in the future. This will need to be reviewed pending revisions to the criteria for investment and implementation of Making Space for water. Implementation of P4, maintains the possibility to move to P6 in the future. The actions focus on short-term steps to increase the resilience of the urban floodplain through redevelopment, start to investigate what the precise benefits would be from achieving more attenuation in the floodplain and safeguarding areas of open space. The costs of the preferred approach are not known. In the short-term there would be a requirement for c.£100k per year to facilitate the change in approach.
Key Actions (Developed in Action Plan)	**Wa1 Short-term planning actions** **Wa2 Long-term adaptation of the urban environment to be more flood resilient** **Wa3 Surface water drainage** **Wa4 Optimising attenuation and conveyance within the catchment in the long-term** **Wa5 Short-term management of flood risk management assets**

	Wa6 Flood warning, flood awareness and emergency planning **Wa7 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor that meets the objectives of the Local Planning Authorities and sustainable flood risk management and evolution of the business to be able to focus on delivering a more sustainable approach. Further work is needed to refine the approach.
Regional Priority (0-5yrs)	Medium overall. Initially we are trying to safeguard those features that will enable us to adopt a more sustainable approach to flood risk management. Planning and evolving the business to deliver the more sustainable approach should occur in the next five years, but the change will be incremental.

	Summary of the Preferred Approach					
Policy Unit	**Beverley Brook**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**2.9%**	of the economic consequences of fluvial flooding in Thames region				
	1.7%	of the social consequences of fluvial flooding in Thames region				
	0.1%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			6689		7826	
Properties (from MDSF)	580	2640	5807			
Total Damages (£m from MDSF)	13.11	79.92	185.22			14.01
Projected Damages (£m)						15.86
Residential Damages			125.53			
Commercial Damages			59.67			
Main clusters or features of the current flood risk	The flood risk is concentrated in the upper part of the catchment. Flooding can happen very rapidly following intense rainfall and there is generally insufficient time to provide an adequate flood warning to over 50% of the properties at risk from fluvial flooding. There is a large, but generally undefined, risk from surface water flooding. Over 1500 properties in the lower part of the catchment are at risk from tidal flooding.					
Area of BAP (km)	None					
Floodplain area	6.1km^2 of floodplain. 56% of the floodplain is urban.					
Watercourse length	24km of which 12km is modified or artificial channel.					
Description of designated sites	Richmond Park SAC and Wimbledon Common SAC but neither are water-dependant					
	Current responses to flood risk within the policy unit					
Total Maintenance Expenditure	**Approx 193k**					
	Major Assets		**High Risk Systems**		**Low & medium Risk**	

Approx. Expenditure	7	171	15
Where			
Purpose of Maintenance	Maintaining conveyance through the dense urban areas.		
Approximate Standards of service that apply	Typically 5% to 2% AEP		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	23%	
	No specific activities planned		
Opportunities & Constraints	Though there are large areas of open space in the lower and middle parts of the catchment, these have limited potential as far as managing flood risk is concerned. This is because the majority of the people and property at risk is located upstream of the open space. The opportunities to reduce flood risk through redevelopment are small compared with other similar catchments in London. There are opportunities to restore watercourses and floodplains in the lower reaches of the policy unit.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. This is so that the probability of flooding can be managed more sustainably and the consequences of flooding have been reduced. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Until there is greater space within the urban corridor, it will not be possible to construct new defences across most of this policy unit. P6: It is not viable to implement this policy in a meaningful way in this policy unit.		
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).		
Justification (Balancing Objectives)	Climate change could have a large impact in the Beverley Brook. This is because of the increasing probability of flooding from tidal (affected by sea-level rise) and surface water sources (affected by more frequent and intense rainfall). However, the level of redevelopment in this policy unit is not high,		

	hence, there is less opportunity in the Beverley Brook to adjust to the increased probability of flooding through spatial planning. With policies in place to encourage set-back from rivers (i.e. with a focus on site layout and design) there is increased potential for culverts, trashscreens and artificial channel to be removed through re-development. This has the potential to increase the length of restored channel from the baseline and also create some new wetland BAP habitat. A lot of the downstream reaches of the Beverley Brook are areas of immediate opportunity for river restoration, mainly due to the presence of areas of large open space (Richmond Park and Wimbledon Common). Two sites on the Pyl Brook have the potential to create over 300m of restored channel in the short-term. Implementation of these approaches will require additional resource. With such a basket of potential approaches it is not possible to define this requirement with any certainty. However, the damages in this policy unit are sufficiently high to justify further investigation of the proposed approaches. The policy recognises the levels of risk in the policy unit, but it is not certain whether we can deliver the policy in the short-term. The actions are intended to start to reduce some of these uncertainties.
Key Actions (Developed in Action Plan)	**BB1 Short-term planning actions** **BB2 Long-term adaptation of the urban environment to be more flood resilient** **BB3 Tidal / fluvial overlaps** **BB4 Surface water drainage** **BB5 Optimising attenuation and conveyance within the catchment in the long-term** **BB6 Flood warning, flood awareness and emergency planning**
Risks, Uncertainties & Dependencies	Flood risk approaches in the lower part of the catchment are dependent on outcomes from the Thames Estuary 2100 project. Unless progress is made on making resilience and resistance responses more commonly available it may be difficult to sustain the proposed policy. This is because climate change is likely to increase the probability of flooding in the upper reaches of the Thames tideway affecting the Beverley Brook. Elsewhere, the low level of regeneration may require additional resource to maintain current standards of conveyance.
Regional Priority (0-5yrs)	Medium overall. This will be a policy unit where we are seeking to make incremental change through spatial planning (recognising the slow rate of change in land use). A large reduction in flood risk will require adoption of alternative approaches (application of resilience / resistance and the management of urban drainage).

	Summary of the Preferred Approach					
Policy Unit	**Hogsmill**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**1.5%**	of the economic consequences of fluvial flooding in Thames region				
	0.9%	of the social consequences of fluvial flooding in Thames region				
	0.1%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**

Properties (from flood zones)			3641		5690	
Properties (from MDSF)	432		1138			
Total Damages (£m from MDSF)	14.67		29.73			3.81
Projected Damages (£m)						6.47
Residential Damages			18.28			
Commercial Damages			11.45			
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	474		1546			
Climate Change (Damages)	16.90		42.60			4.35
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	42		408			
Damages: Actual	2.23		12.87			0.54
Properties: % Change	9.7%		35.9%			
Damages: % Change	15.3%		43.3%			14.2%
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-12.5%		-8.9%			
Damages (%)	-7.1%		-14.3%			-11.3%
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						
Main clusters or features of the current flood risk	Kingston-upon-Thames and along the Surbiton Stream					
Area of BAP (km)	None					
Floodplain area	3.6km^2 of floodplain. 59% of the floodplain is urban.					
Watercourse length	12km of which 9km is modified or artificial channel.					

Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 114k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	0	114	0
Where			
Purpose of Maintenance	Maintenance of channel conveyance		
Approximate Standards of service that apply	5% to 2% AEP		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	4%	
	Detection Improvements: No specific activity planned Flood Awareness Events: No specific activity planned Forecasting Improvements: Rainfall runoff models to be delivered		
Opportunities & Constraints	Typically, we manage the risk of fluvial flooding in developed areas by transferring water into concrete channels and draining the catchment into the Thames. The majority of the river channels in the Hogsmill catchment are modified, often concrete-lined with many culverts and structures. This current approach to managing flood risk is not sustainable. Of all the rivers in London, the Hogsmill has the third highest proportion of watercourse in culvert (13%) Over 25% of the rivers in the Hogsmill catchment are artificial concrete channels which feed into the Thames. This provides a moderate degree of conveyance, which if maintained, reduces the likelihood of properties flooding, but does not remove the risk; the channel capacity might be exceeded, or the system may fail. Not all of the rivers in the Hogsmill catchment have been straightened and concrete lined. There are areas of open space of parks, recreation areas and buffers along railway lines, rivers and other infrastructure. There are some opportunities to utilise these open spaces in the upper part of the catchment for flood storage and attenuation. However flood storage is only effective if combined with the implementation of Sustainable Drainage Systems (SUDS) in key locations which can impact surface water runoff and effective use of the spatial planning system.		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of		

	flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. This is so that the probability of flooding can be managed more sustainably and the consequences of flooding have been reduced. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Until there is greater space within the urban corridor, it will not be possible to construct new defences across most of this policy unit.
Policy	P6: Take action to increase the frequency of flooding to deliver benefits locally or elsewhere (which may constitute an overall flood risk reduction e.g. for habitat inundation)
Justification (Balancing Objectives)	The policy to attenuate flow in the Hogsmill will only be effective if it is implemented alongside approaches that lead to the adaptation of the urban environment in the Lower Reaches of the catchment. This is because in the areas of greatest risk, the sources of flooding include backwater effects from the River Thames, urban run-off as well as fluvial flows. Upstream attenuation can contribute to a more sustainable approach, but it is unlikely to offer a complete solution. At this stage we know that there is the potential to attenuate flow from the Hogsmill, but we do not have a good understanding of the technical, environmental or economic uncertainties. The policy selection is based upon: • The level of risk • The potential to use existing open space to reduce risk • Recognition that this would need to be progressed alongside actions that lead to adaptation of the urban environment through redevelopment. Within the Hogsmill policy unit the most effective and sustainable approaches to managing the existing and future flood risk develop some of the key features of Making Space for Water (urban drainage, strategic application of PPS25, attenuation and re-creating river corridors). The approaches are designed to address the longer-term requirements rather than the short-term. Our aim is to reduce the reliance solely on conveyance, by re-establishing a river corridor, safeguarding land in the upper catchment for future flood storage, and focussing on resilience and flood warning.
Key Actions (Developed in Action Plan)	**Ho1 Short-term planning actions** **Ho2 Long-term adaptation of the urban environment to be more flood resilient** **Ho3 Surface water drainage** **Ho4 Optimising attenuation and conveyance within the catchment in the long-term** **Ho5 Short-term management of assets** **Ho6 Flood warning, flood awareness and emergency planning** **Ho7 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	Implementation of the proposed approach to implementing policy in the Hogsmill are dependent upon; • Safeguarding open space • Adoption of appropriate policies within LDFs • Wider application of Making Space for Water principles (notably the use

	of open space in floodplains, flood resilience, urban drainage) • Evolution of the business
Regional Priority (0-5yrs)	Medium

	Summary of the Preferred Approach					
Policy Unit	**Crane**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**3.4%**	of the economic consequences of fluvial flooding in Thames region				
	1.8%	of the social consequences of fluvial flooding in Thames region				
	0.4%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			6359		9945	
Properties (from MDSF)	3178	5486	7658			
Total Damages (£m from MDSF)	20.62	89.25	205.63			15.58
Projected Damages (£m)						163.62
Residential Damages			133.65			
Commercial Damages			71.98			
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	3770	6427	8599			
Climate Change (Damages)	27.23	128.37	253.20			20.82
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	592	941	941			
Damages: Actual	6.62	39.13	47.58			5.24
Properties: % Change	18.6%	17.2%	12.3%			
Damages: % Change	32.1%	43.8%	23.1%			33.6%
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-7.33%	-10.74%	-6.72%			
Damages (%)	-7.61%	-26.79%	-15.11%			19.90%
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages:						

Actual						
Properties: % Baseline change						
Damages: % Baseline change						

Main clusters or features of the current flood risk	Lower Crane (near confluence with the Thames) e.g. Twickenham, also Yeading Brook (South Ruislip and North Harrow)		
Area of BAP (km)	None		
Floodplain area	9.5km^2 of floodplain. 50% of the floodplain is urban.		
Watercourse length	50km of which 8km is modified or artificial channel. 50% of the channel is classified as maintained channel.		
Description of designated sites	None		
	Current responses to flood risk within the policy unit		
Total Maintenance Expenditure	**Approx 320k**		
	Major Assets	**High Risk Systems**	**Low & medium Risk**
Approx. Expenditure	94	214	12
Where	Hayes FSA		
Purpose of Maintenance	Maintaining existing defences; for example Hayes FSA. Maintenance of channel conveyance.		
Approximate Standards of service that apply	2% to 1% AEP.		
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD	39%	
	Detection Improvements: No specific activity planned Flood Awareness Events: No specific activity planned Forecasting Improvements: Routing models to be delivered Rainfall runoff models to be delivered		
Opportunities & Constraints	Areas of the Crane floodplain are within regeneration areas. There are large areas of open floodplain, particularly in the middle reaches of the Crane policy unit. This open space has the potential to be used for a number of uses e.g. biodiversity, recreation. River restoration		
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous		

	alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is needed to attain this policy. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Additional defences are not considered viable in the foreseeable future. P6: We would be looking to implement this policy over the long-term when the existing defences are replaced so that there we achieve a degree of attenuation in the catchment. This could have positive impacts on environmental, social and economic indicators.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	To accommodate the impacts of climate change we have assumed that 20% of the existing urban floodplain corridor is redeveloped to be resilient to flooding and with a layout taking account of flood risk (particularly on the Yeading Brook). Reductions in the current rates of run-off have been achieved in the upper reaches of the policy unit. There are a number of short-term opportunities for river restoration in the Yeading Brook and Lower Crane including in-channel habitat enhancement and bank restoration. With policies in place to encourage set-back from rivers (i.e. with a focus on site layout and design) there is increased potential for culverts, trashscreens and toe-boarding to be removed through re-development in the more urbanised upstream reaches, such as on the Yeading Brook.
Key Actions (Developed in Action Plan)	**Cr1 Short-term planning actions** **Cr2 Long-term adaptation of the urban environment to be more flood resilient** **Cr3 Surface water drainage** **Cr4Optimising attenuation and conveyance within the catchment in the long-term** **Cr5Short-term management of assets** **Cr6 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	In the Upper catchment implementation is dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor that meets the objectives of the Local Planning Authorities and sustainable flood risk management and evolution of the business to be able to focus on delivering a more sustainable approach. Elsewhere the main dependency is safeguarding the existing natural floodplain.
Regional Priority (0-5yrs)	Medium. A dedicated resource in the near future will maximise the existing opportunities to reduce the consequences of flooding through redevelopment, particularly on the Yeading Brook.

	Summary of the Preferred Approach					
Policy Unit	**Brent**					
	What is currently at risk from flooding: Problem / Risk					
Regional Context	**3.6%**	of the economic consequences of fluvial flooding in Thames region				
	3.9%	of the social consequences of fluvial flooding in Thames region				
	0.7%	of the floodplain, channel and designated environmental assets in Thames region				
	Current Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (from flood zones)			7315		9185	
Properties (from MDSF)	1099	1786	2668			
Total Damages (£m from MDSF)	20.24	38.83	96.76			4.75
Projected Damages (£m)						7.77
Residential Damages			46.81			
Commercial Damages			49.95			
	Future Risk: Economic and Social					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Climate Change (Properties)	1416	2135	3141			
Climate Change (Damages)	28.61	60.24	130.80			6.74
	Difference between baseline and future					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties: Actual	317	349	473			
Damages: Actual	8.36	21.41	34.04			1.99
Properties: % Change	28.8	19.5	17.7			
Damages: % Change	41.3	55.1	35.2			41.9
	Difference between baseline and reducing flow by 10%					
	20% AEP	**5% AEP**	**1% AEP**	**0.5% AEP**	**0.1% AEP**	**AAD**
Properties (%)	-7.19%	-11.59%	-8.17%			
Damages (%)	-20.10%	-19.16%	-16.66%			-17.68%
	Impact of Scenario's on 1% AEP					
Properties: Actual						
Damages: Actual						
Properties: % Baseline change						
Damages: % Baseline change						

Main clusters or features of the current flood risk	Silk Stream and Edgware Brook					
Area of BAP (km)	1km^2 of BAP habitat (reedbed and fen)					
Floodplain area	8.3km^2 of floodplain. 59% of the floodplain is urban.					
Watercourse length	57km of which 17km is modified or artificial channel.					
Description of designated sites	None					
	Current responses to flood risk within the policy unit					
Total Maintenance Expenditure	**Appox 683k**					
	Major Assets		**High Risk Systems**		**Low & medium Risk**	
Approx. Expenditure	90		593		0	
Where						
Purpose of Maintenance	To maintain channel conveyance and to maintain numerous structures in the policy unit. Removal of blockages that can cause flooding.					
Approximate Standards of service that apply	There is a wide range of standards of protection in the Brent catchment. For most areas it is in the range 5% to 2% AEP, but locally it is 1% AEP.					
Flood Warning (activities planned in 2008-09)	Proportion signed-up to FWD			32%		
	Detection Improvements: Site planned at Brentford Flood Awareness Events: No specific activity planned Forecasting Improvements: No specific activity planned					
Opportunities & Constraints	The high level of regeneration planned provides a significant opportunity to reduce the consequences of flooding. Opportunities (linked to regeneration) to restore sections of channel and reduce our dependency on the conveyance of the river channel to manage risk					
Assessment of proposed approach (Against Economic, Social and Environmental Indicators)	P1: Leads to a very large increase in risks to economic and social indicators as defences deteriorate. There are no benefits to environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P2: Increase in risks to social and economic indicators associated with a deterioration in the condition of assets. There are no benefits in reducing activity on environmental indicators. This is because the extent of previous alterations to the watercourses and land use within the floodplain would slow the naturalisation of the policy unit. P3: Risks to social and economic indicators increase in line with the impacts of climate change. A greater focus on managing the consequences of flooding can offset some of the increases in the probability of flooding. The impacts on environmental indicators are largely neutral. P4: Risks to social and economic indicators remain at current day levels. Attaining these benefits through maintenance will not be possible in this policy unit. Widespread adoption of resilience or large scale redevelopment is					

	needed to attain this policy. This is so that the probability of flooding can be managed more sustainably and the consequences of flooding have been reduced. P5: Implementation of this policy will require major redevelopment within the policy unit or an increase in the standard of protection from additional defences. Until there is greater space within the urban corridor, it will not be possible to construct new defences across most of this policy unit. P6: It is not viable to implement this policy in a meaningful way in this policy unit.
Policy	P4: Take further action to sustain the current level of flood risk into the future (responding to the potential increase in risk from urban development, land use change and climate change).
Justification (Balancing Objectives)	The proposed approach has a strong focus upon our objective of changing the character of the urban floodplain over time. The potential economic and social gains in the Brent are significant because of the extensive areas of redevelopment planned (up to 2 square km of floodplain in the Brent is identified as an opportunity area). Providing the proposed (rather than the current) approach to managing flood risk is ultimately implemented then flood risk reduction can be implemented in a sustainable way under P4. The level of redevelopment planned and the potential benefits that could be gained suggest that additional investment would result in tangible benefit. The policy has been selected for the Brent because; • There are over 7,000 properties at risk in a 1% AEP flood event. • 48% of these properties are located in Enumeration Districts which have been classified as socially vulnerable. • There is a moderate standard of protection from flooding. • There are opportunities to reduce the consequences generally across the policy unit and the probability of flooding in some places. In the short-to medium-term it will not be possible to reduce flood risk from all sources to the majority of properties in the Brent policy unit. It is likely that we will be able to reduce the probability to some properties. The focus of the actions that have been identified are to reduce the consequences by increasing the resilience of the urban environment and increase the opportunities to manage the water in the catchment more sustainably in the future. Climate change has quite a large impact on the Brent catchment; for example flood damages increase by 41%, 55% and 35% for the 20%, 5% and 1% AEP events respectively. To achieve the policy we will have to ensure that all redevelopment within the Brent floodplain is appropriate (resilient and resistant to flooding) and continue to increase the level of attenuation in the catchment for both surface water flooding and flood storage. Under this policy option, the length of restored channel and area of BAP wetland habitat is likely to increase as policies such as the Blue Ribbon Network, North London River Restoration strategy and PPS25 are implemented. The majority of the work will be delivered through urban regeneration projects In the lower reaches, there is the potential for river channel and bank restoration and in-channel habitat enhancement. On the Dollis Brook and Silk Stream, there are potentially long stretches of river where toe-boarding can be removed, banks restored and also limited de-culverting in some areas. In Tokyington Park, there is the potential to create

	500m of restored river.
Key Actions (Developed in Action Plan)	**Bt1 Short-term planning actions** **Bt2 Long-term adaptation of the urban environment to be more flood resilient** **Bt3 Surface water drainage** **Bt4 Optimising attenuation and conveyance within the catchment in the long-term** **Bt5 Short-term management of assets** **Bt6 Safeguard future opportunities to reduce the probability of flooding in the future** **Bt7 Tidal / fluvial overlaps**
Risks, Uncertainties & Dependencies	Dependent upon reaching agreement at a strategic level on the vision for the redevelopment of the river corridor that meets the objectives of the Local Planning Authorities and sustainable flood risk management and evolution of the business to be able to focus on delivering a more sustainable approach. Further work is needed to refine the approach. A dedicated resource will be needed in the short-term.
Regional Priority (0-5yrs)	High. A dedicated resource in the near future will maximise the existing opportunities to reduce the consequences of flooding through redevelopment.