East Lothian Council

Members' Library Service Request Form

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Document Title	Appendix 2 (Part 2) to Flood Risk Management Strategy

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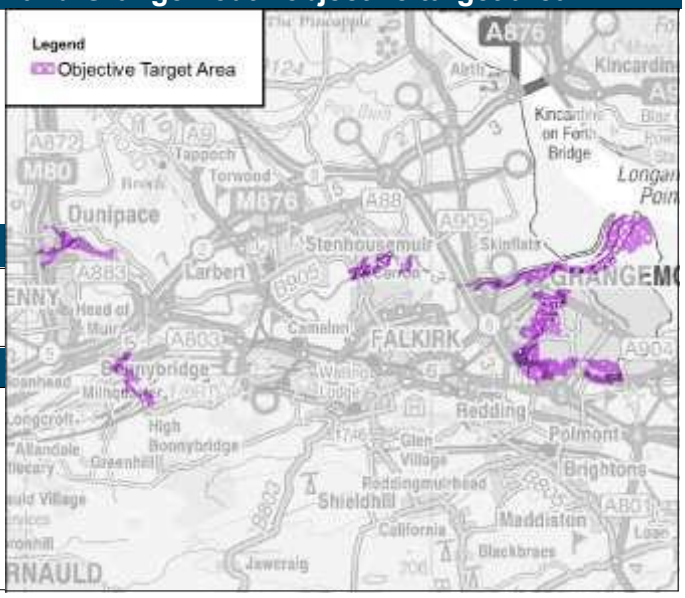
Authorised By	Ray Montgomery
Designation	Head of Infrastructure
Date	25/02/15

For Office Use Only:	
Library Reference	33/15
Date Received	03/05/15
Bulletin	Mar 2015

Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron, Stehousemuir Potentially Vulnerable Area 10/11

Objective(s):	Bonnybridge, Denny, Stenhousemuir and Grangemouth objective target area
Reduce risk to people in Bonnybridge, Denny, Carron and Grangemouth from river and coastal flooding.	
Objective ID:	
10041	
Indicators:	
450 people at risk (from a medium likelihood flood)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100410100	Existing defences along the Grange Burn provide protection to residential and/or non-residential properties. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Runoff control	100410500	Upstream of Bonnybridge, Denny, Stenhousemuir and Grangemouth an area with the potential for runoff control has been identified. This could offer some reduction in flood risk along the River Carron, Loch Coulter Burn, Earl's Burn, Red Burn, and Forth. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
River or floodplain restoration	100410600	Upstream of the target area land with potential for river/ floodplain restoration has been identified. Further analysis has shown that due to its positioning within the catchment and/or its size this action may not reduce flood risk in the target area. *Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.*
Sediment management	100410700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Surge attenuation	100410900	*Creation and restoration of intertidal areas (the foreshore area between the mean high and low water levels) can protect and enhance these ecologically diverse areas, and create space to manage and store tidal flooding, reducing the risk elsewhere.*

Falkirk, Grangemouth, Lauriston, Denny, Redding, Dunipace, Cumbernauld, Carron, Stehousemuir Potentially Vulnerable Area 10/11

Installation / modification of river control structures	100411200	*Control structures on a river can reduce flood levels either by restricting or increasing flow in the channel. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.*
Coastal management	100411300	*Coastal management actions aim to reduce the risk of coastal flooding using designed materials and structures. The actions reduce the impact of waves and erosion by modifying wave action or acting as a barrier to increasing sea levels.*
Construction of direct flood defences	100411400	Within Bonnybridge, Denny, Stenhousemuir and Grangemouth, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Improved understanding	100412200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Falkirk, Grangemouth, Laurieton, Denny, Redding, Dunipace, Cumbernauld, Carron, Stenhousemuir (Potentially Vulnerable Area 10/11)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Falkirk, Stenhousemuir and Carron covered by a surface water management plan	100332381	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Recommended actions agreed by all partners identified by 2017.	Falkirk Council Revenue Budget	Falkirk Council
Polmont covered by a surface water management plan	100452382	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Recommended actions agreed by all partners identified by 2017.	Falkirk Council Revenue Budget	Falkirk Council
Falkirk, Stenhousemuir, Carron, Bo'ness, Carriden, Muirhouses and Polmont integrated catchment study	100452391	An integrated catchment study will be carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Ongoing. Recommended actions agreed by all partners identified by 2017.	Study jointly funded by Falkirk Council and Scottish Water.	Scottish Water led in partnership with Falkirk Council and SEPA
Modelling and other assessments to improve	100352200 100362200	Improved knowledge of the risks from different events	Ongoing. Progression of modelling to improve	Falkirk Council Revenue Budget.	SEPA Falkirk Council

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
knowledge of flood hazards and impacts	100372200 100382200 100392200 100402200 100412200	helps to develop plans to avoid or mitigate future flooding to sensitive areas.	knowledge in areas of identified risk. Incorporation where applicable within SEPA's indicative flood maps.	SEPA Scottish Water	Scottish Water
Maintain Firth of Forth and Tay flood warning scheme	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes	SEPA
Maintenance of existing flood protection schemes	100400100	Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary. Existing defences along the Grange Burn provide protection to residential and/or non-residential properties.	Ongoing	Falkirk Council Revenue Budget.	Falkirk Council
Maintenance of existing flood protection schemes	100410100	**Existing defences along the Grange Burn provide protection to residential**	Ongoing	Falkirk Council Revenue Budget.	Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		and/or non-residential properties. Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.			
Cumbernauld (east) covered by a surface water management plan	10033238	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Recommended actions agreed by all partners identified by 2019.	Subject to funding availability	North Lanarkshire Council (Lead)/Scottish Water
Cumbernauld (east) integrated catchment study.	10033239	An integrated catchment study will be carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Confirmed. Planned to be carried out between 2015-2021.	Subject to funding availability	Scottish Water (Lead)/North Lanarkshire Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Self Help/ Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing	Self-funded	Individuals, businesses, organisations or communities
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing The council prepares and reviews Flood emergency response plans under statutory obligations towards the Civil Contingencies Act 2004. Risk Assessment indicates that the Falkirk area is particularly at risk of Coastal/Tidal flooding together with a lesser risk of fluvial or surface water flooding. These plans are implemented as part of	Proportional funding by appropriate Council's Revenue Budget	Falkirk Council North Lanarkshire Council Stirling Council Emergency Services

Action	Action ID	Description	Status and Timing	Funding	Responsibility
			the Councils Emergency Response Procedures to flooding incidents within the Council area or, if necessary, as part of a multi-agency response by the Forth Valley Local Resilience Partnership to incidents of a more severe and widespread nature.		
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Proportional funding by appropriate Council's Revenue Budget	Falkirk Council North Lanarkshire Council Stirling Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing.	Proportional funding by appropriate Council's Revenue Budget	Falkirk Council North Lanarkshire Council Stirling Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
Relocation of properties/infrastructure away from flood risk areas	100350200 100360200 100370200 100380200 100390200 100400200 104100200	Relocation of properties or infrastructure, currently at risk of flooding, away from the flood risk area may be applicable in locations where frequent flooding is expected to a limited area that may be otherwise difficult or uneconomical to protect. No properties have been identified to be at risk in a high likelihood event and therefore suitable for relocation.	Falkirk Council does not have a relocation policy and has not currently identified a need to progress this.		Falkirk Council
Runoff Control	100350500	Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding. Upstream of Carron/ Carronshore an area with the potential for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and /or its size this action will not reduce flood risk in the target area.	Falkirk Council is not currently exploring the feasibility of this option. The fluvial hydrology of the River Carron is heavily influenced by Scottish Water activity at Carron Valley reservoir.		Falkirk Council

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
River or floodplain restoration	100350600	Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream. Upstream of the target areas land with potential for river or floodplain restoration has been identified. Further analysis has shown that due to its positioning within the catchment and/or its size this action will not reduce flood risk in the target area	Falkirk Council is currently working to bring a Flood Protection Scheme to submission stage for Grangemouth. This scheme extends to the Carron/Carronshore target area. Natural Flood Management Options will be investigated during option engineering. The progression of projects leading towards scheme submission is dependant on Revenue budget allocation. Scheme delivery if confirmation attained will be dependent on Capital Allocation.		Falkirk Council
Sediment Management	100350700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	No sediment management options are currently being progressed. Should any studies identify this option this would if progressed likely to be funded from Falkirk Council's revenue budget and would be subject to sufficient funding being available.		Falkirk Council
Construction of Direct flood Defences	100351400	Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk. Within Carron and Carronshore, the potential to construct direct defences has been identified to reduce the risk to residential and	Falkirk Council is currently working to bring a Flood Protection Scheme to submission stage for Grangemouth. This scheme extends to the Carron/Carronshore target area. Option engineering will identify the appropriate form of any direct defences at this locus. The progression of projects leading towards scheme submission is dependant on Revenue budget allocation. Scheme delivery if confirmation attained will be dependent on Capital Allocation.		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		non-residential properties from a medium likelihood flood event.			
Property level protection	100351700 100361700 100381700 100401700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths <0.6m in areas of high probability flooding. No properties have been identified to be at risk in a high likelihood event and therefore suitable for property level protection.	The provision of property level protection is at the discretion of the property owner.		Property Owner
Flood warning schemes	100351800 100371800 100401800 100411800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being a priority are dependent on funding. The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement		SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
			new flood warning schemes.		
Site protection plans	100352100 100362100 100372100 100382100 100392100 100402100 100412100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Awareness raising from SEPA will help business owners determine their own needs.		Business Owner/Network Operator
Runoff Control	100360500	Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding. Upstream of Falkirk an area with the potential to be used for runoff control has been identified. This could offer a limited reduction in flood risk along the River Carron, Earl's Burn, Loch Coulter Burn and Avon Burn for high likelihood events.	Falkirk Council is not currently exploring the feasibility of this option. The fluvial Hydrology of this river Carron is heavily influenced by Scottish Water activity at Carron Valley reservoir.		Falkirk Council
Sediment Management	100360700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of	No sediment management options are currently being progressed. Should any studies identify this option this would if progressed likely to be funded from Falkirk Councils revenue budget and would be subject to sufficient funding being available.		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		siltation at structures and other key areas.			
Construction of Direct flood Defences	100361400	Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk. Within Falkirk, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.	Falkirk Council is currently working to bring a Flood Protection Scheme to submission stage for Grangemouth. This scheme extends to the Falkirk target area. Option engineering will identify the appropriate form of any direct defences at this locus. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependent on Capital Allocation.		Falkirk Council
Runoff Control	100370500	Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding. Upstream of Falkirk Westquarter an area with the potential to be used for runoff control has been identified. This could offer a limited reduction in flood risk along the Glen Burn and Westquarter Burn for high	Falkirk Council is not actively investigating Run off control options in this area. Should any studies be identified, their progression would have to be prioritised along with other Revenue funded projects.		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		likelihood events.			
Sediment Management	100370700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	The need for sediment management in smaller watercourses is assessed regularly and would be progressed should the need arise. Should any studies be identified, their progression would have to be prioritised along with other Revenue funded projects.		Falkirk Council
Construction of Direct flood Defences	100371400	Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk. Within Falkirk Westquarter, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.	Falkirk Council is not currently progressing a flood protection scheme at this locus. Scheme progression should one be deemed appropriate would require revenue funding to develop the required studies and investigations. These studies if/when considered appropriate will require Revenue budget allocation.		Falkirk Council
Runoff Control	100380500	Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding. Upstream of Denny and Dunipace an area with the	Falkirk Council is not actively investigating runoff control options in this area. Should any studies be identified, their progression would have to be prioritised along with other Revenue funded projects.		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		potential to be used for runoff control has been identified. This could offer a limited reduction in flood risk along the River Carron, Loch Coulter Burn and Earl's Burn for high likelihood events.			
Sediment Management	100380700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	The need for sediment management in smaller watercourses is assessed regularly and would be progressed should the need arise. The Avon Burn at Allan Crescent is currently being progressed with a view to undertaking sediment management works, if deemed necessary Falkirk Council would progress alongside regular watercourse maintenance operations. Progression will have to be prioritised along with other Revenue funded projects.		Falkirk Council
Construction of Direct flood Defences	100381400	Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk. Within Denny and Dunipace, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.	Falkirk Council is not currently progressing a flood protection scheme at this locus. Scheme progression should one be deemed appropriate would require revenue funding to develop the required studies and investigations. These studies if/when considered appropriate will require Revenue budget allocation.		Falkirk Council
Runoff Control	100390500	Runoff control actions look to enhance the natural catchment ability to capture	Falkirk Council is not actively investigating runoff control options in this area. Should any studies be identified, their progression would have to be		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding. Upstream of Bonnybridge and Banknock an area with the potential for runoff control has been identified. This could offer a limited reduction in flood risk along the Red Burn, Forth & Clyde Canal, Doups Burn and Bonny Water for high likelihood events.	prioritised along with other Revenue funded projects.		
Sediment Management	100390700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	The need for sediment management in smaller watercourses is assessed regularly and would be progressed should the need arise. Should any studies be identified, their progression would have to be prioritised along with other Revenue funded projects.		Falkirk Council
Construction of Direct flood Defences	100391400	Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk. Within Bonnybridge and Banknock, the potential to construct direct defences has been identified to reduce	Falkirk Council is not currently progressing a flood protection scheme at this locus. Scheme progression should one be deemed appropriate would require revenue funding to develop the required studies and investigations. These studies if/when considered appropriate will require Revenue budget allocation.		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		the risk to residential and non-residential properties from a medium likelihood flood event.			
Runoff Control	100400500	Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding. Upstream of Grangemouth an area with the potential to be used for runoff control has been identified. This could offer a limited reduction in flood risk along the Glen Burn, Westquarter Burn and some drains for high likelihood events.	Falkirk Council is currently working to bring a Flood Protection Scheme to submission stage for Grangemouth. The appropriate use of runoff control options will be investigated during option engineering. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependent on Capital allocation.		Falkirk Council
River or floodplain restoration	100400600	Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream. Upstream of Grangemouth land with the potential for river or floodplain restoration has been identified. Further	Falkirk Council is currently working to bring a Flood Protection Scheme to submission stage for Grangemouth. The contribution of Natural Flood Management Options will be investigated during option engineering. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependant on Capital allocation.		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		analysis has shown that due to its positioning within the catchment and/or its size this action will not reduce flood risk in the target area.			
Sediment Management	100400700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	The need for sediment management in smaller watercourses is assessed regularly and would be progressed should the need arise. Should any studies be identified, their progression would have to be prioritised along with other Revenue funded projects.		Falkirk Council
Creation/restoration of intertidal area including mudflats and saltmarsh, and regulated tidal exchange	100400900	Creation and restoration of intertidal areas (the foreshore area between the mean high and low water levels) can protect and enhance these ecologically diverse areas, and create space to manage and store tidal flooding, reducing the risk elsewhere.	If confirmed as appropriate would require to be progressed during the option engineering of any schemes being progressed. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependant on Capital allocation.		Falkirk Council
Installation / modification of fluvial control structures	100401200	Fluvial control structures can reduce flood levels to a target area by either restricting or increasing channel flow. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.	If confirmed as appropriate would require to be progressed during the option engineering of any schemes being progressed. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependant on Capital allocation.		Falkirk Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Coastal management	100401300	Coastal management actions aim to reduce the risk of coastal flooding using designed materials and structures. The actions reduce the impact of waves and erosion by modifying wave action or acting as a barrier to increasing sea levels.	If confirmed as appropriate would require to be progressed during the option engineering of any schemes being progressed. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependant on Capital allocation.		Falkirk Council
Construction of Direct flood Defences	100401400	Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk. Within Grangemouth, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.	Falkirk Council is currently working to bring a Flood Protection Scheme to submission stage for Grangemouth. This scheme extends to the Falkirk target area. Option engineering will identify the appropriate form of any direct defences at this locus. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependent on Capital Allocation.		Falkirk Council
Runoff Control	100410500	Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding.	Should any studies be identified, their progression would have to be prioritised along with other Revenue funded projects. If a scheme has been identified the appropriate use of runoff control options will be investigated during option engineering. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependant on Capital allocation.		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		Upstream of Bonnybridge, Denny, Stenhousemuir and Grangemouth an area with the potential for runoff control has been identified. This could offer a limited reduction in flood risk along the River Carron, Loch Coulter Burn, Earl's Burn, Red Burn, Forth.			
River or floodplain restoration	100410600	Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream. Upstream of the target area land with potential for river/ floodplain restoration has been identified. Further analysis has shown that due to its positioning within the catchment and/or its size this action will not reduce flood risk in the target area.	Falkirk Council is currently working to bring a Flood Protection Scheme to submission stage for Grangemouth. The contribution of Natural Flood Management Options will be investigated during option engineering. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependant on Capital allocation. No other schemes have been identified.		Falkirk Council
Sediment Management	100410700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	The need for sediment management in smaller watercourses is assessed regularly and would be progressed should the need arise. Should any studies be identified, their progression would have to be prioritised along with other Revenue funded projects.		Falkirk Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Creation/restoration of intertidal area including mudflats and saltmarsh, and regulated tidal exchange	100410900	Creation and restoration of intertidal areas (the foreshore area between the mean high and low water levels) can protect and enhance these ecologically diverse areas, and create space to manage and store tidal flooding, reducing the risk elsewhere.	If confirmed as appropriate would require to be progressed during the option engineering of any schemes being progressed. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependent on Capital allocation.		Falkirk Council
Installation / modification of fluvial control structures	100411200	Fluvial control structures can reduce flood levels to a target area by either restricting or increasing channel flow. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.	If confirmed as appropriate would require to be progressed during the option engineering of any schemes being progressed. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependent on Capital allocation		Falkirk Council
Coastal management	100411300	Coastal management actions aim to reduce the risk of coastal flooding using designed materials and structures. The actions reduce the impact of waves and erosion by modifying wave action or acting as a barrier to increasing sea levels.	If confirmed as appropriate would require to be progressed during the option engineering of any schemes being progressed. The progression of projects leading towards scheme submission is dependant on Revenue allocation. Scheme delivery if confirmation attained will be dependant on Capital allocation		Falkirk Council
Construction of Direct flood Defences	100411400	Direct defence actions aim to reduce the risk of flooding by	Falkirk Council is currently working to bring a Flood Protection Scheme to submission stage for		Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		placing a designed barrier between the flooding source and the receptors at flood risk. Within Bonnybridge, Denny, Stenhousemuir and Grangemouth, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.	Grangemouth. Option engineering will identify the appropriate form of any direct defences at this locus. The progression of projects leading towards scheme submission is dependant on Revenue allocation as will any other scheme should they be identified as a future priority. Scheme delivery if confirmation attained will be dependant on Capital Allocation.		
Improve signup of Firth of Forth and Tay flood warning scheme	100993491822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding. The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.		SEPA
Simplify Firth of Forth and Tay flood warning scheme	100993491830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding. The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.		SEPA

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Develop new flood warning. Properties affected by flooding from the River Carron and tributaries downstream of Carron Valley Reservoir.	100994351800	The inclusion of these areas of potential hasn't taken into account the feasibility of offering a warning in each location so they will be subject to further screening and analysis of technical, operational and financial feasibility.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding. The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.		SEPA
Develop new flood warning. Properties in Falkirk affected by flooding from the Grange Burn/Westquarter Burn.	100994381800	The inclusion of these areas of potential hasn't taken into account the feasibility of offering a warning in each location so they will be subject to further screening and analysis of technical, operational and financial feasibility.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding. The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.		SEPA

Bo'ness (Potentially Vulnerable Area 10/12)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	West Lothian Council, Falkirk Council	Forth Estuary (South) Coastal

Background

This Potentially Vulnerable Area covers an area of 23km^2 and is part of the Firth of Forth catchment. This is a small, partially urbanised coastal area in the south of the catchment centred around the town of Bo'ness (Figure 1). The Potentially Vulnerable Area does not have any notable watercourses and the majority of damages are caused by surface water flooding (Figure 2). The highest risk of coastal flooding is from the Firth of Forth to Bo'ness. The highest risk of surface water flooding is also in Bo'ness.

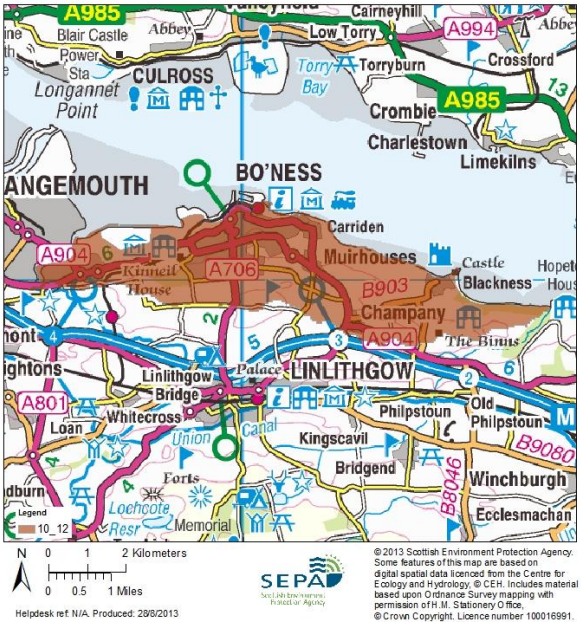


Figure 1: Bo'ness Potentially Vulnerable Area

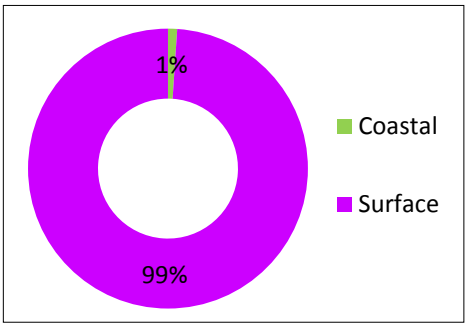


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 200 residential properties and 70 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £510,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential property followed by damages to roads.

In 2010 Scottish Water carried out a Flood Risk Assessment Study of water and wastewater assets across Scotland. Of the assets assessed, 2 wastewater assets were identified as being at risk of flooding within this Potentially Vulnerable Area.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	110	200	590
No. of non-residential properties	10	70	210
No. of people	240	440	1,300
Community facilities	0	0	<10 Emergency services buildings
Utilities	<10 Energy sites	20 Energy sites <10 Scottish Water assets	50 Energy sites <10 Scottish Water assets
Transport links (excluding minor roads)	6 Roads affected at 46 locations • 4 A roads • 2 B roads	7 Roads affected at 73 locations • 5 A roads • 2 B roads	7 Roads affected at 81 locations • 5 A roads • 2 B roads
Environmental designated areas (km^2)	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC
No. of cultural heritage sites	6	7	19
Agricultural land (km^2)	0.1km^2	0.4km^2	0.6km^2

Table 1: Summary of flooding impacts

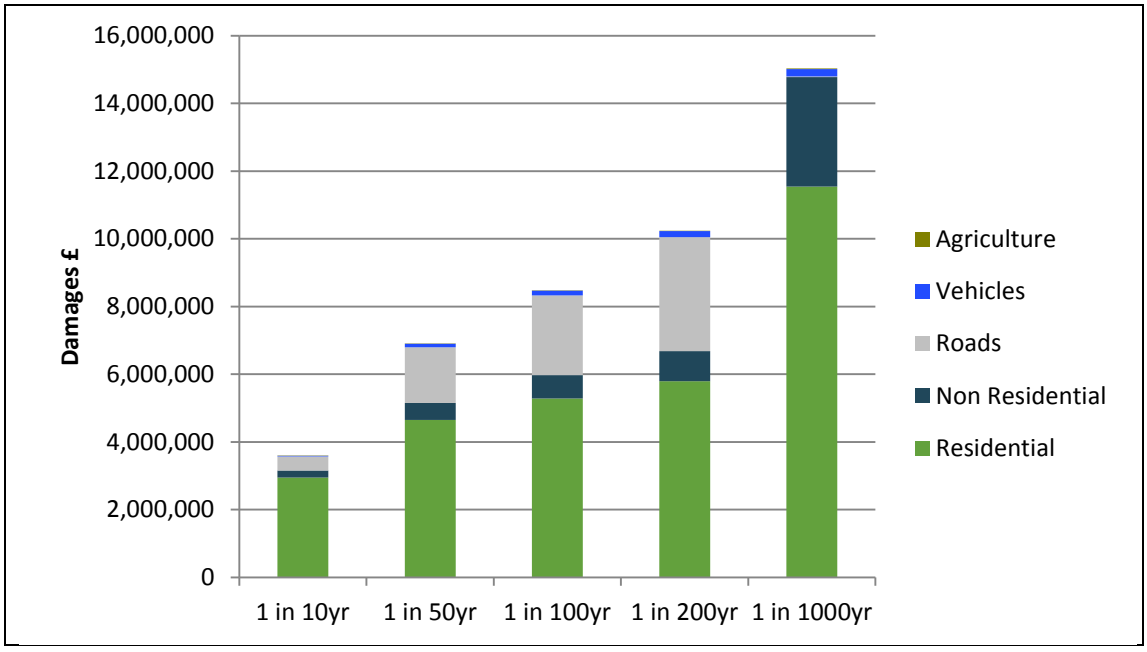


Figure 3: Damages by flood frequency

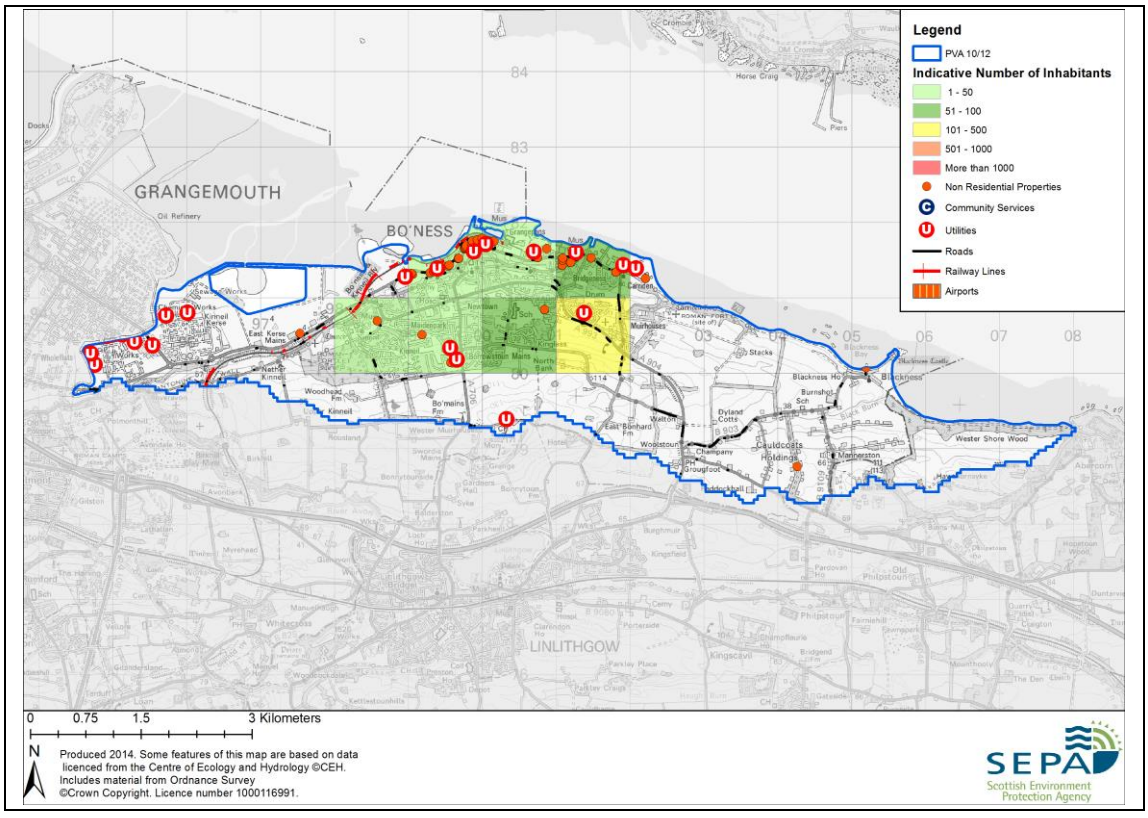


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

No significant coastal or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There is one formal flood protection scheme in this Potentially Vulnerable Area. This is the Bo'ness Flood Protection Scheme which reduces the risk of coastal flooding.

Other actions and natural features may also reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There are two flood warning target areas within this Potentially Vulnerable Area:

- Blackness - Coastal flood warning, Firth of Forth;
- Grangemouth - Coastal flood warning, Firth of Forth.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

Some local authorities have their own policies regarding property level protection. Contact your local authority or view their website for more information.

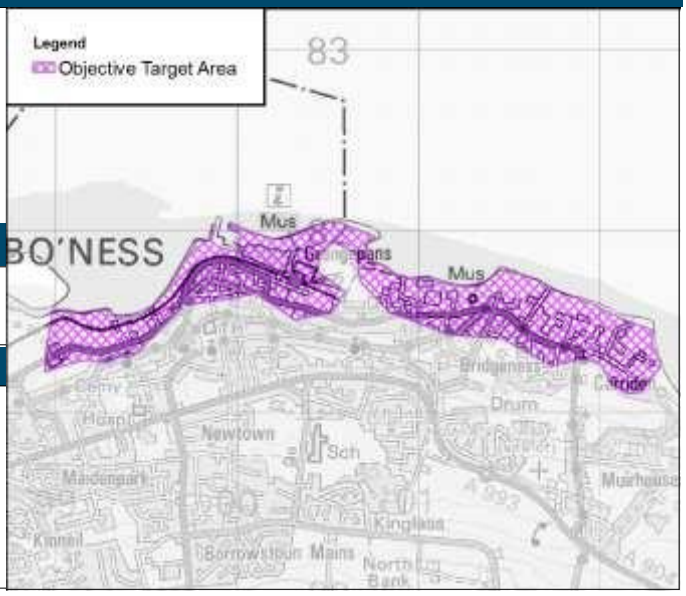
Bo'ness
Potentially Vulnerable Area 10/12
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Bo'ness	Accept significant flood risk in Bo'ness is managed appropriately. Maintain existing actions that reduce the risk of coastal flooding in Bo'ness.	10044

Bo'ness
Potentially Vulnerable Area 10/12
Objectives and potential actions

Objective(s):	Bo'ness objective target area
Accept significant flood risk in Bo'ness is managed appropriately. Maintain existing actions that reduce the risk of coastal flooding in Bo'ness.	
Objective ID:	
10044	
Indicators:	
270 residential properties protected by Flood Protection Scheme (from medium likelihood flood)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100440100	Existing coastal defences provide protection to residential and/or non-residential properties. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Site protection plans	100442100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

BO'NESS (Potentially Vulnerable Area 10/12)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Bo'ness, Carriden and Muirhouses covered by a surface water management plan	10042238	The area must be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Recommended actions agreed by all partners identified by 2017.	Falkirk Council Revenue budget	Falkirk Council
Flood warning schemes – Maintain Firth of Forth and Tay **coastal** flood warning scheme	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Maintenance of existing flood protection schemes	100440100	Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary. Existing defences on Bo'ness	Ongoing	Falkirk Council Revenue Budget.	Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		foreshore provide protection to residential and/or non-residential properties.			
Self Help/ Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing	No specific funding identified	Individuals, businesses, organisations or communities
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing The council prepares and reviews Flood emergency response plans under statutory obligations towards the Civil Contingencies Act 2004. Risk Assessment indicates that the Falkirk area is particularly at risk of Coastal/Tidal flooding together with a lesser risk of fluvial or surface water flooding. These plans are implemented	Proportional funding by appropriate Council's Revenue Budget	Falkirk Council West Lothian Council Emergency Services

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
			as part of the Councils Emergency Response Procedures to flooding incidents within the Council area or, if necessary, as part of a multi-agency response by the Forth Valley Local Resilience Partnership to incidents of a more severe and widespread nature.		
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Proportional funding by appropriate Council's Revenue Budget	Falkirk Council West Lothian Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing.	Proportional funding by appropriate Council's Revenue Budget	Falkirk Council West Lothian Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Site protection plans	100442100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network	Awareness raising from SEPA will help business owners determine their own needs.		Business Owner/Network Operator
Flood warning schemes – Improve sign up of Firth of Forth and Tay **coastal** flood warning scheme	100993491822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.
Flood warning schemes – Simplify Firth of Forth and Tay **coastal** flood warning scheme	100993491830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.
Develop new flood warning. Properties affected by coastal	100994461800	The inclusion of these areas of potential hasn't taken into	Potential actions are drawn from a short list of	The maintenance of SEPA's flood warning	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
flooding at Bo'ness		account the feasibility of offering a warning in each location so they will be subject to further screening and analysis of technical, operational and financial feasibility.	options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	

Linlithgow Bridge, Bathgate, Whiteside and Slamannan (Potentially Vulnerable Area 10/13)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	West Lothian Council, North Lanarkshire Council, Falkirk Council	River Avon

Background

This Potentially Vulnerable Area covers an area of 165km^2 and is part of the Firth of Forth catchment. This is a large, mainly rural area in the south of the catchment containing the towns of Linlithgow, Armadale, Slamannan and Bathgate (Figure 1). The main watercourse is the River Avon which flows from its source in the far west, eastward through northern Slamannan and Avonbridge, before flowing north past Linlithgow. Other notable watercourses include the Logie Water, Couston Water, Bathgate Water, Brunton Burn and Mains Burn. The highest risk of river flooding is from Linlithgow Loch, Bathgate Water, Bell's Burn, River Avon and Culloch Burn to Linlithgow, Bathgate and Slamannan.

The highest risk of surface water flooding is in Linlithgow, Armadale and Bathgate. The majority of flood damages are caused by surface water flooding (Figure 2).

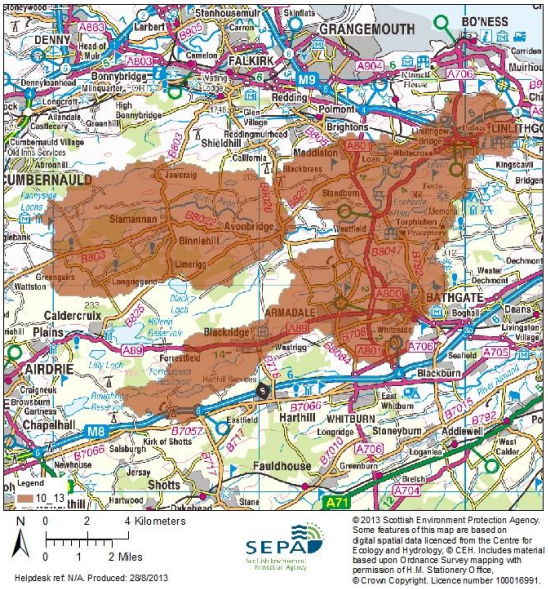


Figure 1: Linlithgow Bridge, Bathgate, Whiteside, Slamannan Potentially Vulnerable Area

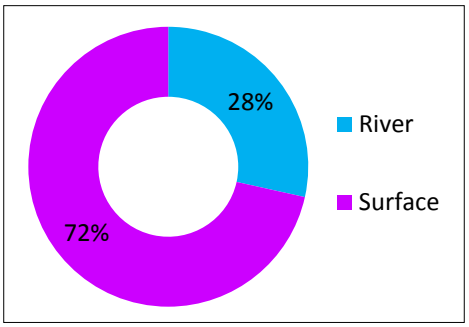


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 490 residential properties and 210 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £1.6 million. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	110	490	940
No. of non-residential properties	110	210	450
No. of People	240	1,100	2,100
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities	<10 Energy sites	30 Energy sites	50 Energy sites
Transport links (excluding minor roads)	22 Roads affected at 192 locations • M8, M9 • 6 A roads • 14 B roads 1 Railway route affected at 5 locations • Edinburgh Waverley to Glasgow Queen Street	22 Roads affected at 275 locations • M8, M9 • 6 A roads • 14 B roads 1 Railway routes affected at 10 locations • Edinburgh Waverley to Glasgow Queen Street	22 Roads affected at 276 locations • M8, M9 • 6 A roads • 14 B roads 1 Railway route affected at 15 locations • Edinburgh Waverley to Glasgow Queen Street
Environmental designated areas (km^2)	2.1km^2 • 4 SSSI • 1 SPA • 1 SAC	2.1km^2 • 4 SSSI • 1 SPA • 1 SAC	2.2km^2 • 4 SSSI • 1 SPA • 1 SAC
No. of cultural heritage sites	7	7	12
Agricultural land (km^2)	4.3km^2	5.2km^2	5.5km^2

Table 1: Summary of flooding impacts

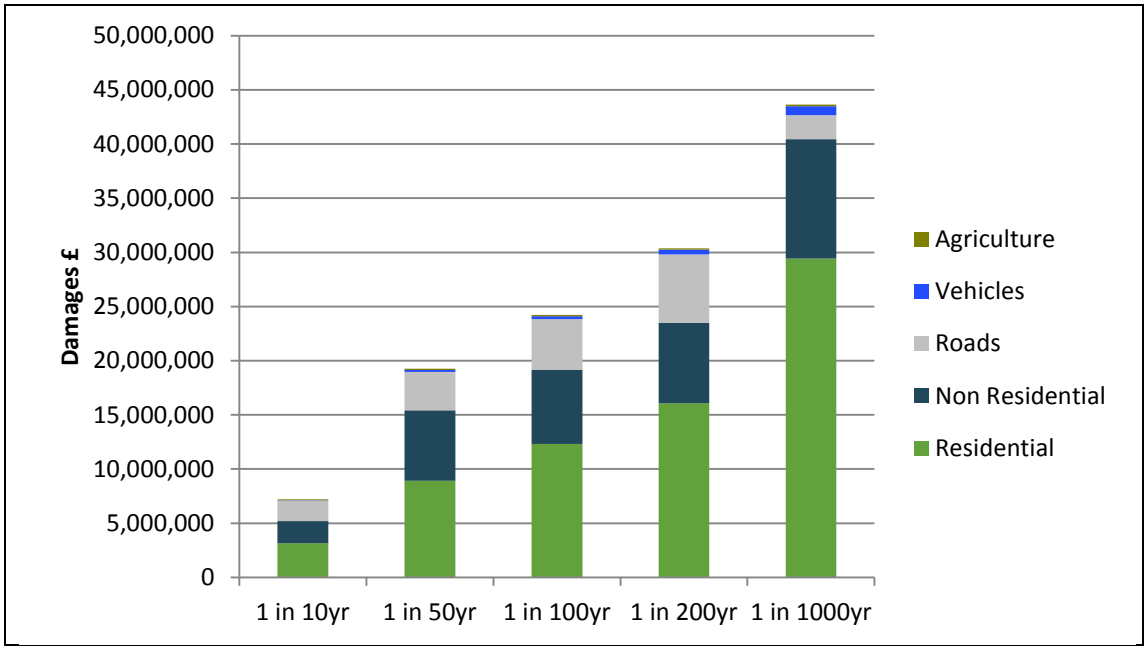


Figure 3: Damages by flood frequency

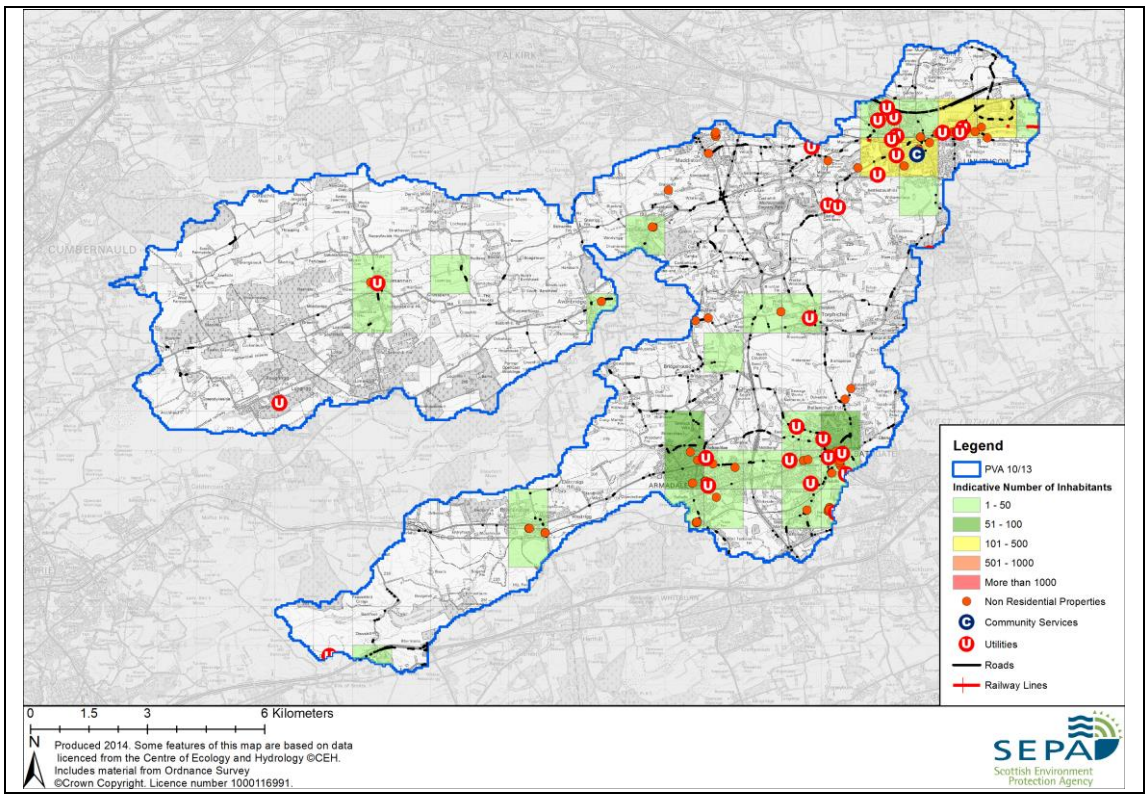


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river flood has been identified as significant in this Potentially Vulnerable Area.

- 1998/1999: A series of flood events in Linlithgow during this period and the previous year resulted in the promotion of the Linlithgow Flood Prevention Scheme.

No significant surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There is one formal flood protection scheme in this Potentially Vulnerable Area. This is the Linlithgow Flood Protection Scheme which reduces the risk of river flooding. Other actions and natural features may also reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition the following incentives or subsidies have been put in place to provide property owners with property level resilience/resistance actions:

- West Lothian Council provides sandbags for public use during an emergency situation. Sandbags and ‘Aquasacs’ are stored at key fire stations throughout the council area.

Some local authorities have their own policies regarding property level protection. Contact your local authority or view their website for more information.

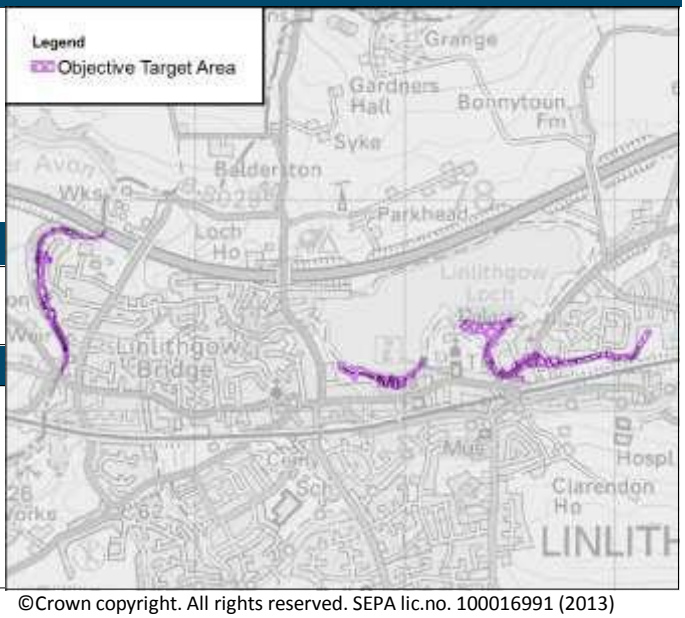
Linlithgow Bridge, Bathgate, Whiteside, Slamannan Potentially Vulnerable Area 10/13 Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local District Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Linlithgow	Reduce economic damages to residential and non-residential properties in Linlithgow caused by flooding from the River Avon and Bell's Burn.	10047
Remainder of the Potentially Vulnerable Area	Reduce economic damages to residential and non-residential properties caused by river flooding.	10048
Bathgate, Blackridge, Linlithgow and Slamannan	Reduce risk to people in Bathgate, Blackridge, Linlithgow and Slamannan from river flooding.	10049

Linlithgow Bridge, Bathgate, Whiteside, Slamannan Potentially Vulnerable Area 10/13 Objectives and potential actions

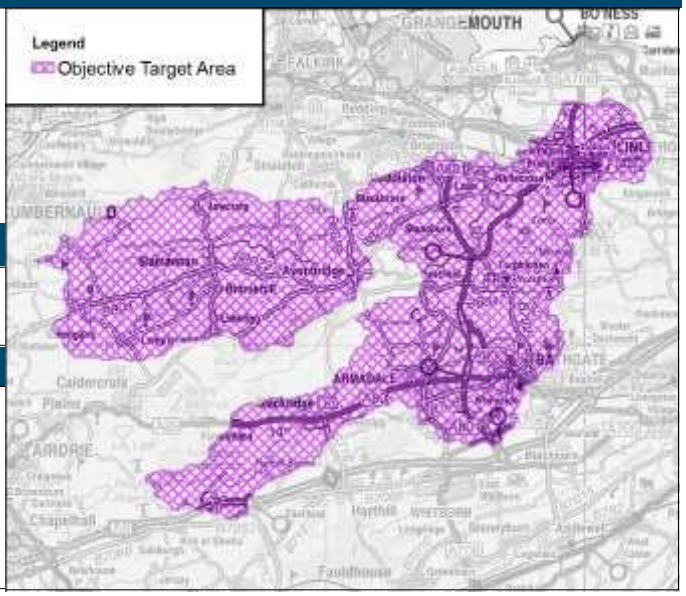
Objective(s):	Linlithgow objective target area
Reduce economic damages to residential and non-residential properties in Linlithgow caused by flooding from the River Avon and Bell's Burn.	
Objective ID:	
10047	
Indicators:	
£120,000 annual average damages (residential properties) £70,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100470100	Existing defences along the Mains Burn provide protection to residential and/or non-residential properties up to a 1 in 120 year flood. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Runoff control	100470500	Upstream of Linlithgow an area with the potential to be used for runoff control has been identified. This could offer some reduction in flood risk along the River Avon, Avon Water, Lin Mill Burn and Forrest Burn Water for high likelihood floods. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
River or floodplain restoration	100470600	Upstream of Linlithgow land with potential for river or floodplain restoration has been identified. Further analysis has shown that due to its positioning within the catchment and/or its size, this action may not reduce flood risk in the target area. *Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.*
Sediment management	100470700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100471100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*

Linlithgow Bridge, Bathgate, Whiteside, Slamannan Potentially Vulnerable Area 10/13 Objectives and potential actions

Construction of direct flood defences	100471400	Within Linlithgow, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100471700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100472100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100472200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Linlithgow Bridge, Bathgate, Whiteside, Slamannan Potentially Vulnerable Area 10/13 Objectives and potential actions

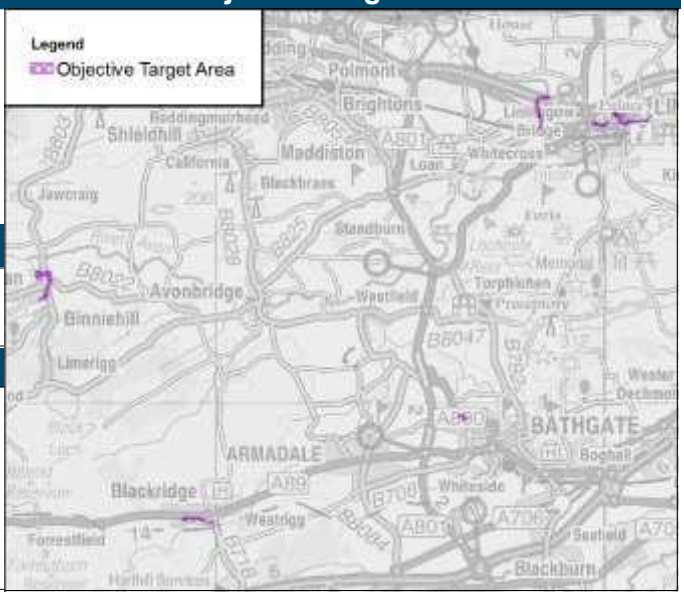
Objective(s):	Remainder of the PVA objective target area
Reduce economic damages to residential and non-residential properties caused by river flooding.	
Objective ID:	
10048	
Indicators:	
£130,000 annual average damages (residential properties) £68,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Runoff control	100480500	An area with the potential to be used for runoff control has been identified. This could offer some reduction in flood risk along the Culloch Burn and some drains for high likelihood floods. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
River or floodplain restoration	100480600	Land with the potential to be used for river or floodplain restoration has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action may not reduce flood risk in the target area. *Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.*
Sediment management	100480700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100481100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Installation / modification of river control structures	100481200	*Control structures on a river can reduce flood levels either by restricting or increasing flow in the channel. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.*
Construction of direct flood defences	100481400	The potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*

Linlithgow Bridge, Bathgate, Whiteside, Slamannan Potentially Vulnerable Area 10/13 Objectives and potential actions

Property level protection	100481700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100482100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100482200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*
Relocation	100480200	Some of the properties that have been identified to be at risk of flooding may be suitable for relocation. *Relocation of properties or infrastructure may be applicable in locations where frequent flooding is expected and where areas may otherwise be difficult or uneconomical to protect.*

Linlithgow Bridge, Bathgate, Whiteside, Slamannan Potentially Vulnerable Area 10/13 Objectives and potential actions

Objective(s):	Bathgate, Blackridge, Linlithgow & Slamannan objective target area
Reduce risk to people in Bathgate, Blackridge, Linlithgow and Slamannan from river flooding.	
Objective ID:	
10049	
Indicators:	
240 people at risk (from a medium likelihood flood)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100490100	*Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Runoff control	100490500	Upstream of Bathgate, Blackridge, Linlithgow and Slamannan an area with the potential to be used for runoff control has been identified. This could offer some reduction in flood risk for high likelihood floods. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
River or floodplain restoration	100490600	Upstream of the target area land with potential for river or floodplain restoration has been identified. Further analysis has shown that due to its positioning within the catchment and/or its size this action may not reduce flood risk in the target area *Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.*
Sediment management	100490700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100491100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Construction of direct flood defences	100491400	The potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*

Linlithgow Bridge, Bathgate, Whiteside, Slamannan Potentially Vulnerable Area 10/13 Objectives and potential actions

Improved understanding	100492200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Linlithgow Bridge Bathgate Whiteside Slamannan (Potentially Vulnerable Area - 10/13)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Bathgate Surface Water Management Plan	100452381	Bathgate will be covered by a Surface Water Management Plan that sets objectives for the management of surface water flood risk and identifies the most sustainable actions to achieve the objectives.	Ongoing. Recommended actions agreed by all partners identified by 2019	West Lothian Capital Investment	West Lothian Council
Linlithgow Surface Water Management Plan	10045238	Linlithgow will be covered by a Surface Water Management Plan that sets objectives for the management of surface water flood risk and identifies the most sustainable actions to achieve the objectives.	Ongoing. Recommended actions agreed by all partners identified by 2019	West Lothian Capital Investment	West Lothian Council
Linlithgow Integrated Catchment Study	10045239	An Integrated Catchment Study will be carried out for Linlithgow to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network and watercourses.	Confirmed. Planned to be carried out commencing 2015	West Lothian capital investment and Scottish Water investment	Scottish Water led in partnership with West Lothian Council and SEPA
Maintenance of existing flood	100470100	**Existing defences along**	Ongoing	West Lothian Council	West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
protection schemes.		**the Mains Burn provide protection to residential and/or non-residential properties up to a 1 in 120 year event.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.		revenue allocation	
Modelling and other assessments to improve knowledge of flood hazards and impacts.	100472200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Confirmed	West Lothian Council capital investment	West Lothian Council
Modelling and other assessments to improve knowledge of flood hazards and impacts	100482200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Confirmed	Proportional funding by appropriate Council's Revenue Budgets	West Lothian Council Falkirk Council
Maintenance of existing flood protection schemes.	100490100	Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance	Ongoing	West Lothian Council revenue allocation	West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		activities may vary.			
Modelling and other assessments to improve knowledge of flood hazards and impacts	100492200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Confirmed	Proportional funding by appropriate Council's Revenue Budgets	West Lothian Council Falkirk Council
Self Help / Awareness Raising	-	Self-help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals businesses organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on understanding and awareness of the flood risk.	Ongoing	North Lanarkshire Council will encourage property owners to self-fund	Individuals, businesses, organisations or communities at risk of flooding.
Emergency Plans	-	Emergency Response Plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	West Lothian Council Individuals, businesses, organisations or communities at risk of flooding. Emergency Services
Land Use Planning	-	Application of national and	Ongoing	Proportional funding by	West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		local planning policies, including objectives and actions identified in the LPD development plan.		appropriate Council's Revenue Budgets	North Lanarkshire Council Falkirk Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing	West Lothian Council revenue investment North Lanarkshire Council action subject to revenue funding availability after prioritisation of council budgets.	West Lothian Council Landowners North Lanarkshire Council

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Runoff Control	100470500	**Upstream of Linlithgow an area with the potential to be used for run-off control has been identified. This could offer a limited reduction in flood risk along the River Avon, Avon Water, Lin Mill Burn and Forrest Burn Water for high likelihood events.** Runoff control actions look to enhance the natural catchment ability to capture	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding.			
River or floodplain restoration	100470600	**Upstream of Linlithgow land with the potential for river or floodplain restoration has been identified. Further analysis has shown that, due to its positioning within the catchment and/or size, this action will not reduce flood risk in the target area.** Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council
Sediment Management	100470700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council
Modification of Conveyance	100471100	Conveyance modification aims to reduce flooding by moving flow more efficiently:	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and		West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	timing of those actions that are identified as being of priority are dependent on funding.		
Construction of Direct flood Defences	100471400	**Within Linlithgow, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.** Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council
Property level protection	100471700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		Property Owner West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		flood depths <0.6m in areas of high probability flooding.			
Site protection plans	100472100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		Business Owner West Lothian Council
Relocation of properties/infrastructure away from flood risk areas	100480200	**Properties have been identified to be at risk in a high likelihood event and may therefore be suitable for relocation.** Relocation of properties or infrastructure, currently at risk of flooding, away from the flood risk area may be applicable in locations where frequent flooding is expected to a limited area that may be otherwise difficult or uneconomical to protect.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council Falkirk Council
Runoff Control	100480500	**An area with the potential to be used for run-off control has been identified. This could offer a limited reduction in flood risk along the Culloch Burn and some drains for high likelihood events.**	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council/ North Lanarkshire Council Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding.			
River or floodplain restoration	100480600	**Land with the potential to be used for river or floodplain restoration has been identified. Further analysis has shown that, due to its positioning within the catchment and/or its size, this action will not reduce flood risk in the target area.** Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council / North Lanarkshire Council Falkirk Council
Sediment Management	100480700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council/ North Lanarkshire Council Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		other key areas.			
Modification of Conveyance	100481100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council/ North Lanarkshire Council Falkirk Council
Installation / modification of fluvial control structures	100481200	Fluvial control structures can reduce flood levels to a target area by either restricting or increasing channel flow. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council/ North Lanarkshire Council Falkirk Council
Construction of Direct Flood Defences	100481400	**The potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood event.** Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council/ North Lanarkshire Council Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		risk.			
Property level protection	100481700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths <0.6m in areas of high probability flooding.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		Property Owner West Lothian Council/ North Lanarkshire Council Falkirk Council
Site protection plans	100482100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		Business Owner West Lothian Council/ North Lanarkshire Council Falkirk Council
Modelling and other assessments to improve knowledge of flood hazards and impacts	100482200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on the funding settlement from Scottish Government for the period 2016-2021.		North Lanarkshire Council Falkirk Council
Runoff Control	100490500	**Upstream of Bathgate Blackridge Linlithgow and**	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their		West Lothian Council Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		Slammanan an area with the potential to be used for run-off control has been identified. This could offer a limited reduction in flood risk for high likelihood events. Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding.	relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		
River or floodplain restoration	100490600	**Upstream of the target area land with potential for river or floodplain restoration has been identified. Further analysis has shown that due to its positioning within the catchment and/or its size this action will not reduce flood risk in the target area.** Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council Falkirk Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Sediment Management	100490700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council Falkirk Council
Modification of Conveyance	100491100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council Falkirk Council
Construction of Direct flood Defences	100491400	**The potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood event.** Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council Falkirk Council

Philipstoun (Potentially Vulnerable Area 10/14)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	West Lothian Council, Falkirk Council	Forth Estuary (South) Coastal

Background

This Potentially Vulnerable Area covers an area of 27km^2 and is part of the Firth of Forth catchment. This is a small, rural area in the south east of the catchment containing the small rural village of Philipstoun (Figure 1).

There is a low risk of flooding in this area. The majority of these damages are caused by surface water flooding (Figure 2).

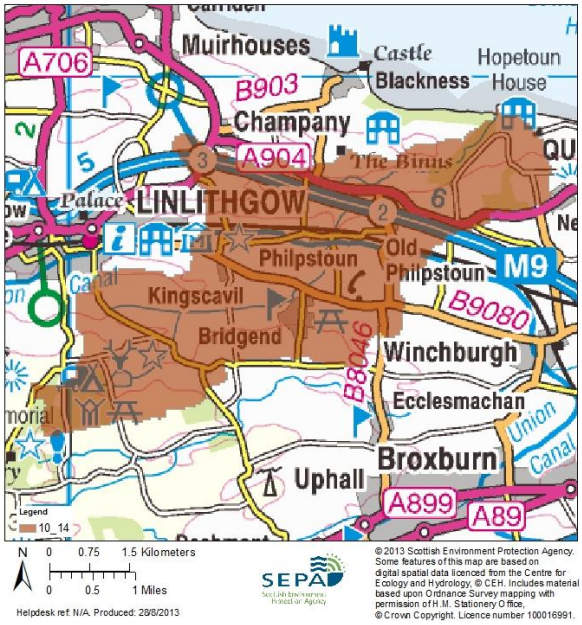


Figure 1: Philipstoun Potentially Vulnerable Area

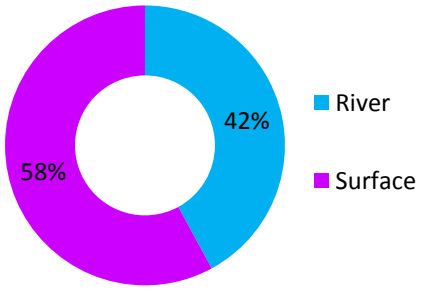


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

A summary of the impacts from flooding can be seen in Table 1 and a map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £23,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	0	0	0
No. of non-residential properties	<10	10	10
No. of people	0	0	0
Community facilities	0	0	0
Utilities	<10 Energy sites	<10 Energy sites	<10 Energy sites
Transport links (excluding minor roads)	4 Roads affected at 17 locations • M9 • 1 A road • 2 B roads 1 Railway route affected at 6 locations • Edinburgh Waverly to Glasgow Queen Street	4 Roads affected at 17 locations • M9 • 1 A road • 2 B roads 1 Railway route affected at 7 locations • Edinburgh Waverly to Glasgow Queen Street	4 Roads affected at 17 locations • M9 • 1 A road • 2 B roads 1 Railway route affected at 7 locations • Edinburgh Waverly to Glasgow Queen Street
Environmental designated areas (km^2)	$0.1km^2$ • 1 SSSI • 1 SPA • 1 SAC	$0.1km^2$ • 1 SSSI • 1 SPA • 1 SAC	$0.1km^2$ • 1 SSSI • 1 SPA • 1 SAC
No. of cultural heritage sites	3	3	3
Agricultural land (km^2)	$0.6km^2$	$0.7km^2$	$0.7km^2$

Table 1: Summary of flooding impacts

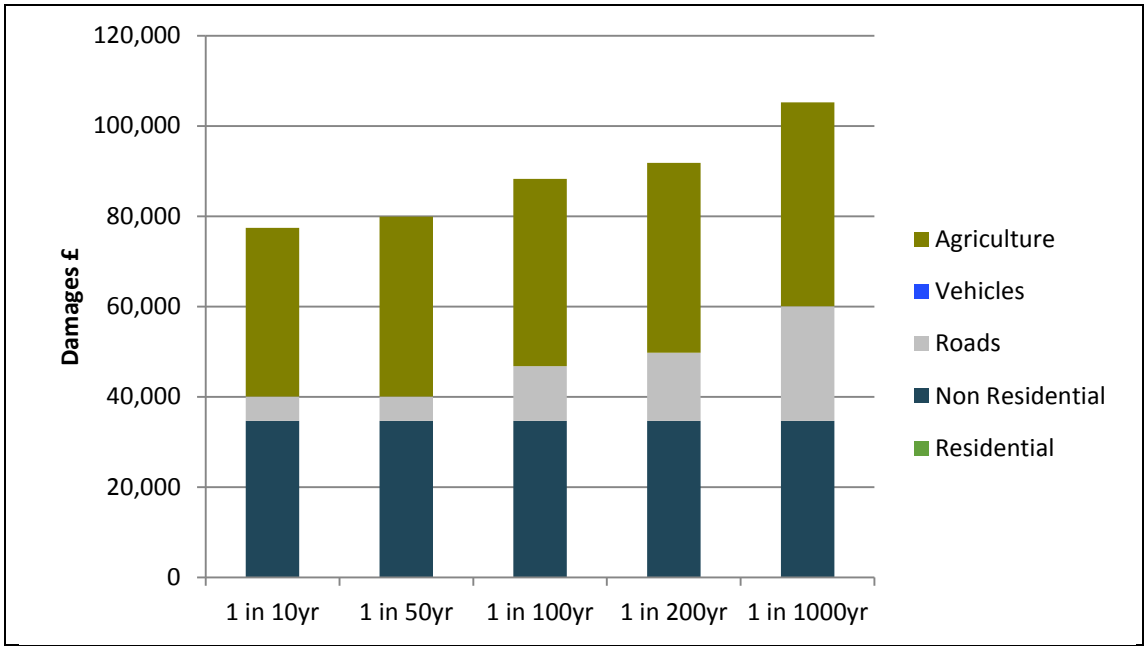


Figure 3: Damages by flood frequency

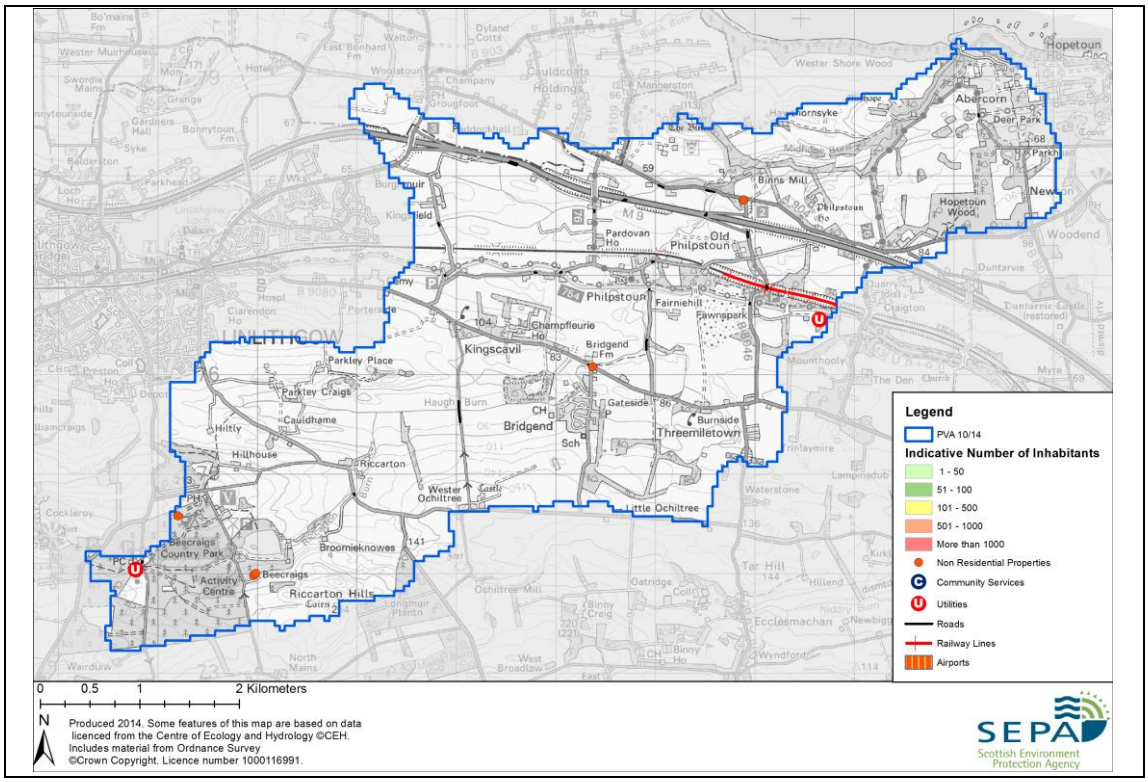


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

No significant river or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition the following incentives or subsidies have been put in place to provide property owners with property level resilience/resistance actions:

- West Lothian Council provides sandbags for public use during an emergency situation. Sandbags and 'Aquasacs' are stored at key fire stations throughout the council area.

Some local authorities have their own policies regarding property level protection. Contact your local authority or view their website for more information.

Philipstoun
Potentially Vulnerable Area 10/14
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; Potential actions for flood warning, land use planning and surface water planning are described in the Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see Applies across Forth Estuary Local Plan District Local Plan District objectives and potential actions.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see Applies across Forth Estuary Local Plan District Local Plan District objectives and potential actions.	10099

Philipstoun (Potentially Vulnerable Area 10/14)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing.	Self-funded.	Individuals, businesses, organisations or communities at risk of flooding.
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing.	Proportional funding by appropriate Council's Revenue Budgets	Falkirk Council West Lothian Council Emergency Services
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing.	Proportional funding by appropriate Council's Revenue Budgets	Falkirk Council West Lothian Council
Watercourse Maintenance	-	Watercourse maintenance	Ongoing.	Proportional funding by	Falkirk Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.		appropriate Council's Revenue Budgets	West Lothian Council Landowner

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

South Queensferry (Potentially Vulnerable Area 10/15)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	West Lothian Council, City of Edinburgh Council	Forth Estuary (South) Coastal

Background

This Potentially Vulnerable Area covers an area of 23km^2 and is part of the Firth of Forth catchment. This is a small, coastal area in the south east of the catchment centred around the coastal town of Queensferry on the southern bank of the Firth of Forth (Figure 1).

There is low flood risk in this area. The majority of flood damages are caused by coastal flooding (Figure 2).

Figure 1: South Queensferry Potentially Vulnerable Area

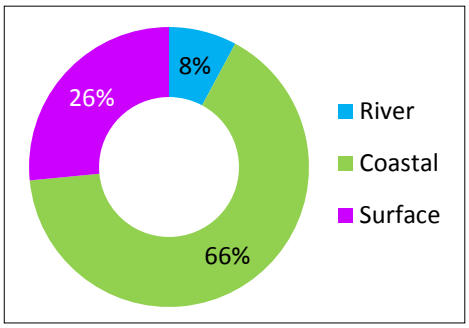


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 10 residential properties and 10 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1 and a map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £32,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3.

In 2010 Scottish Water carried out a Flood Risk Assessment Study of water and wastewater assets across Scotland. Three wastewater assets were identified as being at risk of flooding within this Potentially Vulnerable Area.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	0	10	10
No. of non-residential properties	<10	10	10
No. of people	0	20	20
Community facilities	0	0	0
Utilities	0	<10 Scottish Water assets	<10 Scottish Water assets
Transport links (excluding minor roads)	4 Roads affected at 22 locations • M9 • 1 A road • 2 B roads 1 Railway route affected at 2 locations • Fife Circle: Dalmeny to Winchburgh and Haymarket West Junctions	4 Roads affected at 26 locations • M9 • 1 A road • 2 B roads 1 Railway route affected at 2 locations • Fife Circle: Dalmeny to Winchburgh and Haymarket West Junctions	4 Roads affected at 27 locations • M9 • 1 A road • 2 B roads 1 Railway route affected at 2 locations • Fife Circle: Dalmeny to Winchburgh and Haymarket West Junctions
Environmental designated areas (km^2)	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC
No. of cultural heritage sites	3	4	4
Agricultural land (km^2)	<0.01km^2	0.1km^2	0.1km^2

Table 1: Summary of flooding impacts

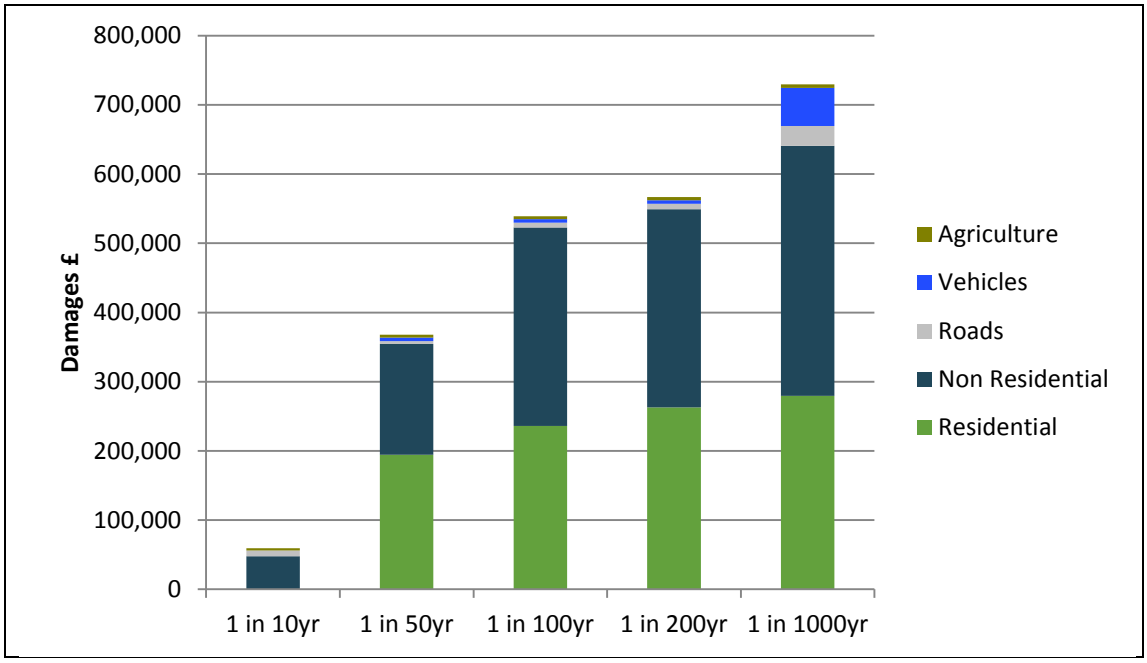


Figure 3: Damages by flood frequency

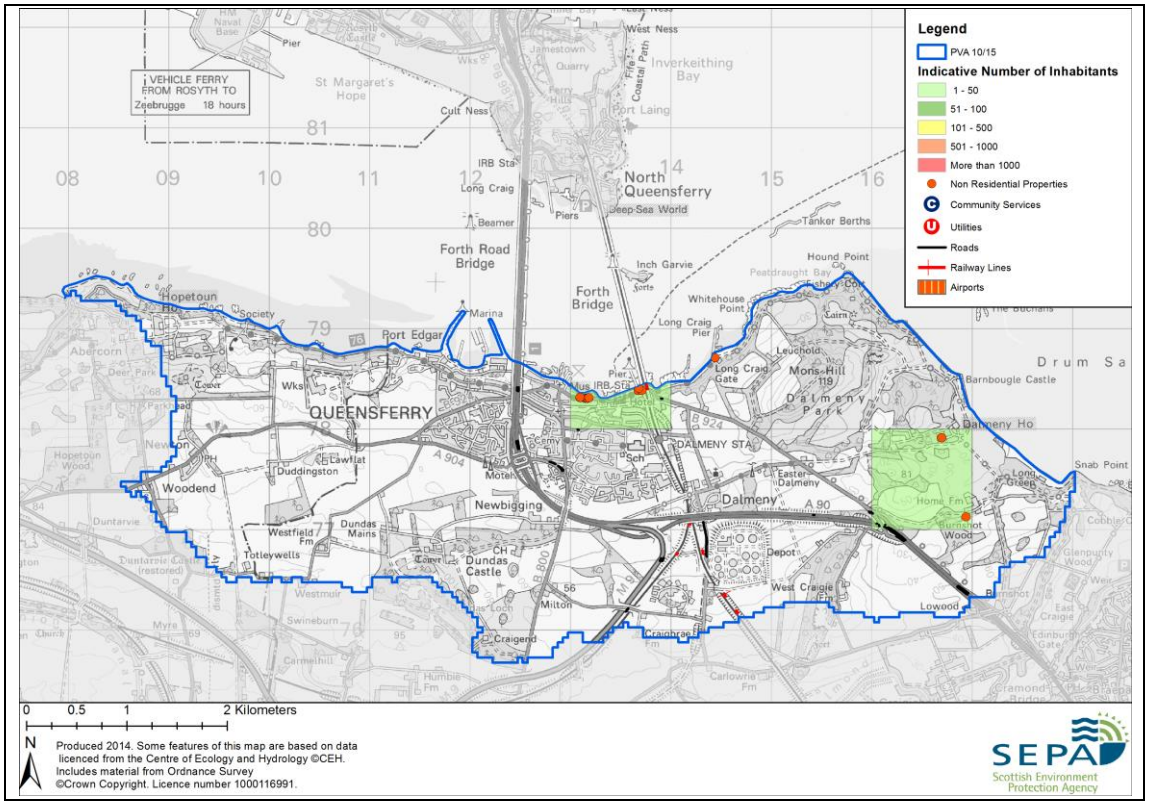


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

No significant river, coastal or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition, the following incentives or subsidies have been put in place to provide property owners with property level resilience/resistance actions:

- The City of Edinburgh Council owns 450m of temporary pallet barriers that can be utilised to protect properties from river flooding. In addition to this, the Council also has 8,000 sandbags and there are a further 1,500 sandbags located in fire stations throughout the City which can be utilised by the public during flood events. The Council also operates Emergency Action Packs that

are used to determine where people should be deployed during flood events. This includes drawings, maps and sandbag constructions drawings.

- West Lothian Council provides sandbags for public use during an emergency situation. Sandbags and ‘Aquasacs’ are stored at key fire stations through the council area.

Queensferry
Potentially Vulnerable Area 10/15
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; Potential actions for flood warning, land use planning and surface water planning are described in the Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see Applies across Forth Estuary Local Plan District Local Plan District objectives and potential actions.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see Applies across Forth Estuary Local Plan District Local Plan District objectives and potential actions.	10099

Queensferry (Potentially Vulnerable Area 10/15)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing.	Self-funded.	Individuals, businesses, organisations or communities at risk of flooding.
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing.	Proportional funding by appropriate Council's Revenue Budgets	City of Edinburgh Council West Lothian Council Emergency Services
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing.	Proportional funding by appropriate Council's Revenue Budgets	City of Edinburgh Council West Lothian Council
Watercourse Maintenance	-	Watercourse maintenance	Ongoing.	Proportional funding by	City of Edinburgh

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.		appropriate Council's Revenue Budgets	Council West Lothian Council Landowner

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Cramond Bridge (Potentially Vulnerable Area 10/16)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	City of Edinburgh Council	Edinburgh Coastal

Background

This Potentially Vulnerable Area covers an area of 15km^2 and is part of the Almond and Edinburgh Group catchment. This is a small area in the north of the catchment on the eastern outskirts of Edinburgh containing the suburbs of Clermiston and Cramond (Figure 1).

The most significant flood source is from surface water which also causes the majority of flood damages (Figure 2).

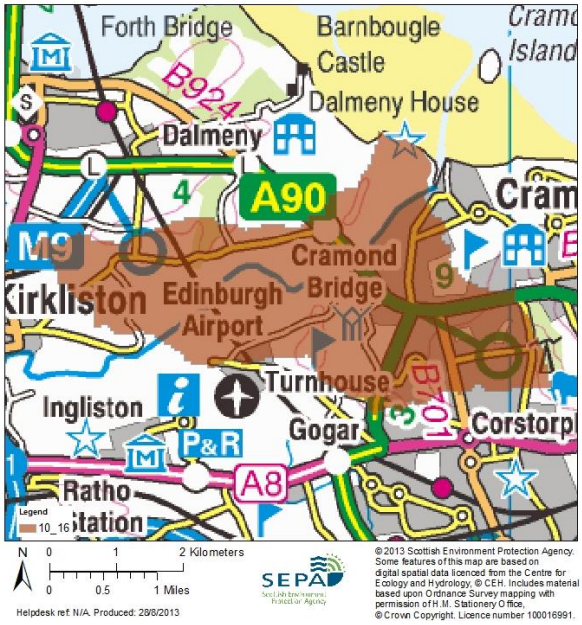


Figure 1: Cramond Bridge Potentially Vulnerable Area

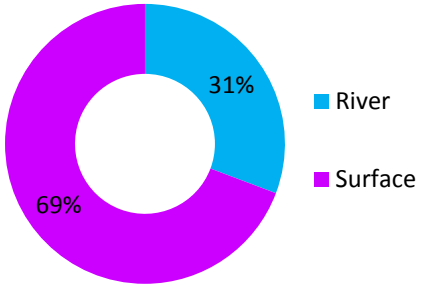


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 60 residential properties and 20 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £110,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	10	60	100
No. of non-residential properties	<10	20	20
No. of people	20	130	220
Community facilities	0	0	0
Utilities	0	<10 Energy sites	<10 Energy sites
Transport links (excluding minor roads)	2 Roads affected at 6 locations • 2 A roads 1 Railway route affected at 5 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions	3 Roads affected at 15 locations • 2 A roads • 1 B road 1 Railway route affected at 5 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions Edinburgh Airport	3 Roads affected at 20 locations • 2 A roads • 1 B road 1 Railway route affected at 6 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions Edinburgh Airport
Environmental designated areas (km^2)	0.1km^2 • 1 SSSI • 1 SPA	0.1km^2 • 1 SSSI • 1 SPA	0.1km^2 • 1 SSSI • 1 SPA
No. of cultural heritage sites	6	6	6
Agricultural land (km^2)	1.7km^2	1.9km^2	2.0km^2

Table 1: Summary of flooding impacts

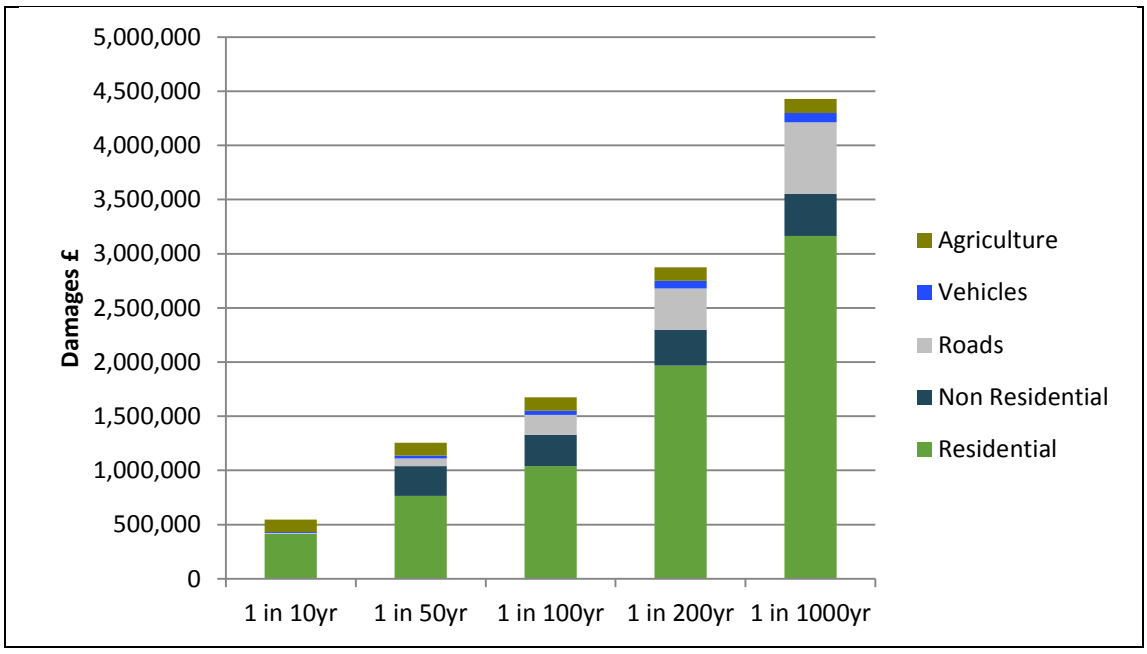


Figure 3: Damages by flood frequency

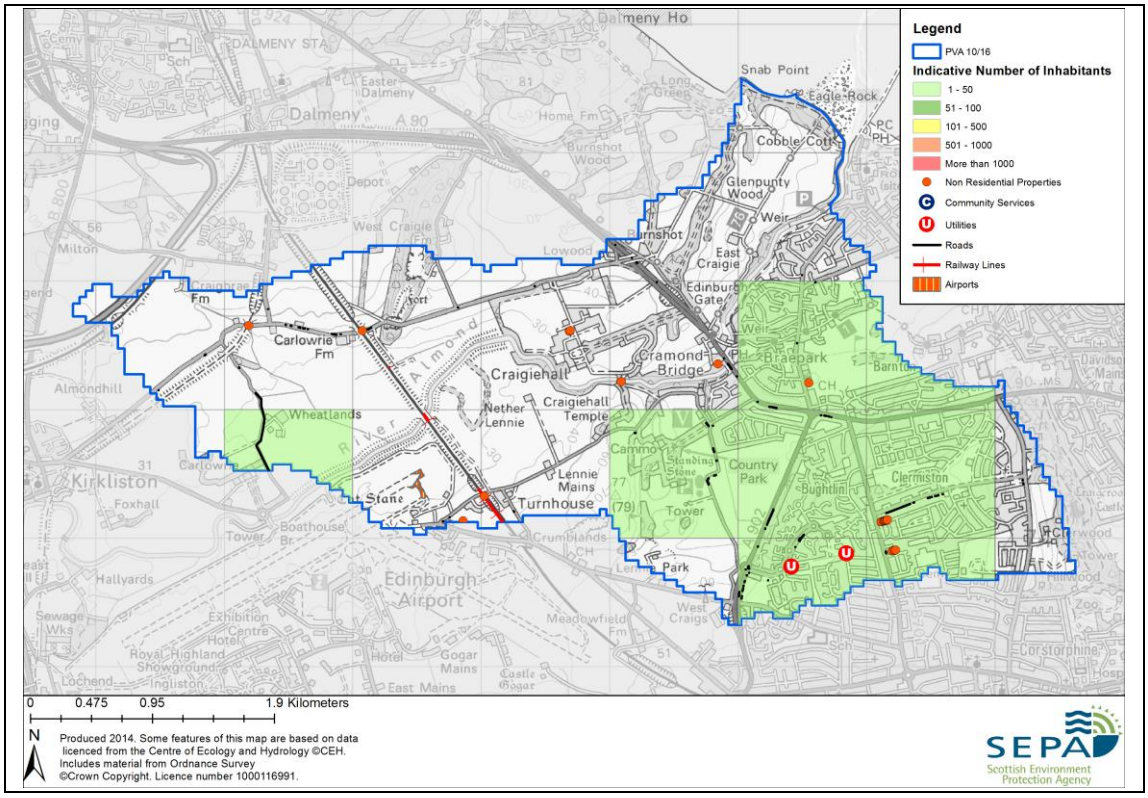


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

No significant river, coastal or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There is one flood warning target area within this Potentially Vulnerable Area:

- Cramond - River flood warning, Almond.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition, the following incentives or subsidies have been put in place to provide property owners with property level resilience/resistance actions:

- The City of Edinburgh Council owns 450m of temporary pallet barriers that can be utilised to protect properties from river flooding. The Council also

holds 8,000 sandbags and there are a further 1,500 sandbags located in fire stations throughout the City which can be utilised by the public during flood events. Furthermore, the Council operates Emergency Action Packs that are used to determine where people should be deployed during flood events.

Cramond Bridge
Potentially Vulnerable Area 10/16
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; Potential actions for flood warning, land use planning and surface water planning are described in the Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see Applies across Forth Estuary Local Plan District Local Plan District objectives and potential actions.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see Applies across Forth Estuary Local Plan District Local Plan District objectives and potential actions.	10099

Cramond Bridge (Potentially Vulnerable Area 10/16)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Edinburgh & Lothian Integrated Catchment Study	10052239	An integrated catchment study is being carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Ongoing. Results of study will be apparent by 2017.	Proportional funding of the study by appropriate Council's Revenue Budget Scottish Water	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Surface Water Management Plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Proportional funding of the study by appropriate Council's Revenue Budget	City of Edinburgh Council and boundary local authorities
Flood Warning Schemes - Maintain **Almond** flood warning scheme	100951800 100993211810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing.	Self-funded.	Individuals, businesses, organisations or communities at risk of flooding.
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council Emergency Services
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council Landowner

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		undertaken as a regular planned activity or in response to a flood event.			
POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.					
Flood warning schemes – Improve sign up of **Almond** flood warning scheme	100951800 100993211821	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Flood warning schemes – simplify **Almond** flood warning scheme	100993211830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA

Granton (Potentially Vulnerable Area 10/17)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	City of Edinburgh Council	Edinburgh Coastal

Background

This Potentially Vulnerable Area covers an area of 13km^2 and is part of the Almond and Edinburgh Group catchment. This is a small, urbanised coastal area in the north of the catchment in the north of Edinburgh containing the suburbs of Silverknowes, Muirhouse, Granton, eastern Cramond and the Port of Leith (Figure 1).

The flood sources include coastal and surface water. The highest risk of surface water flooding is in Clermiston. The majority of flood damages are caused by surface water flooding (Figure 2).

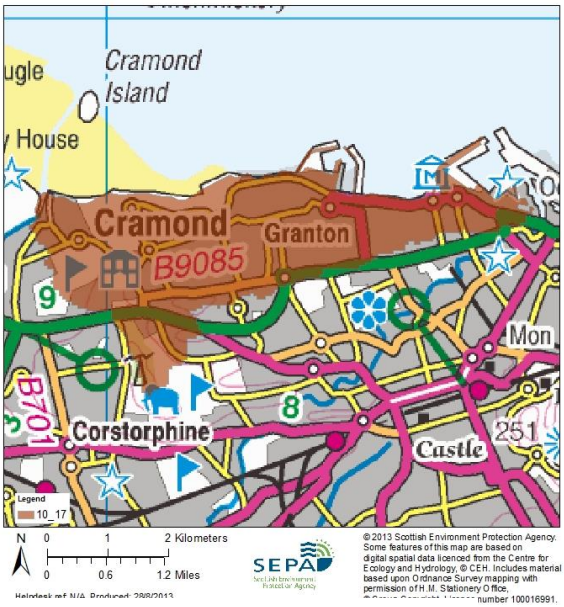


Figure 1: Granton Potentially Vulnerable Area

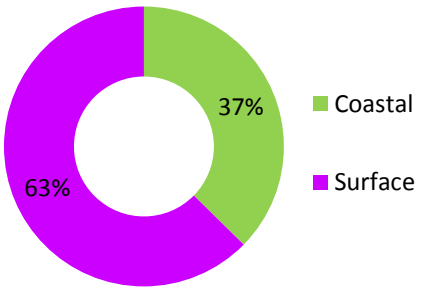


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 290 residential properties and 60 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1 and a map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £250,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties.

	High Likelihood	Medium Likelihood	Low Likelihood
No. of residential properties	10	290	360
No. of non-residential properties	<10	60	80
No. of people	20	640	790
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities	<10 Energy sites	20 Energy sites	30 Energy sites
Transport links (excluding minor roads)	3 Roads affected at 10 locations • 2 A roads • 1 B road	4 Roads affected at 31 locations • 3 A roads • 1 B road	4 Roads affected at 38 locations • 3 A roads • 1 B road
Environmental designated areas (km^2)	0.3km^2 • 1 SSSI • 1 SAC • 1 SPA	0.3km^2 • 1 SSSI • 1 SAC • 1 SPA	0.3km^2 • 1 SSSI • 1 SAC • 1 SPA
No. of cultural heritage sites	1	2	2
Agricultural land (km^2)	<0.01km^2	<0.01km^2	<0.01km^2

Table 1: Summary of flooding impacts

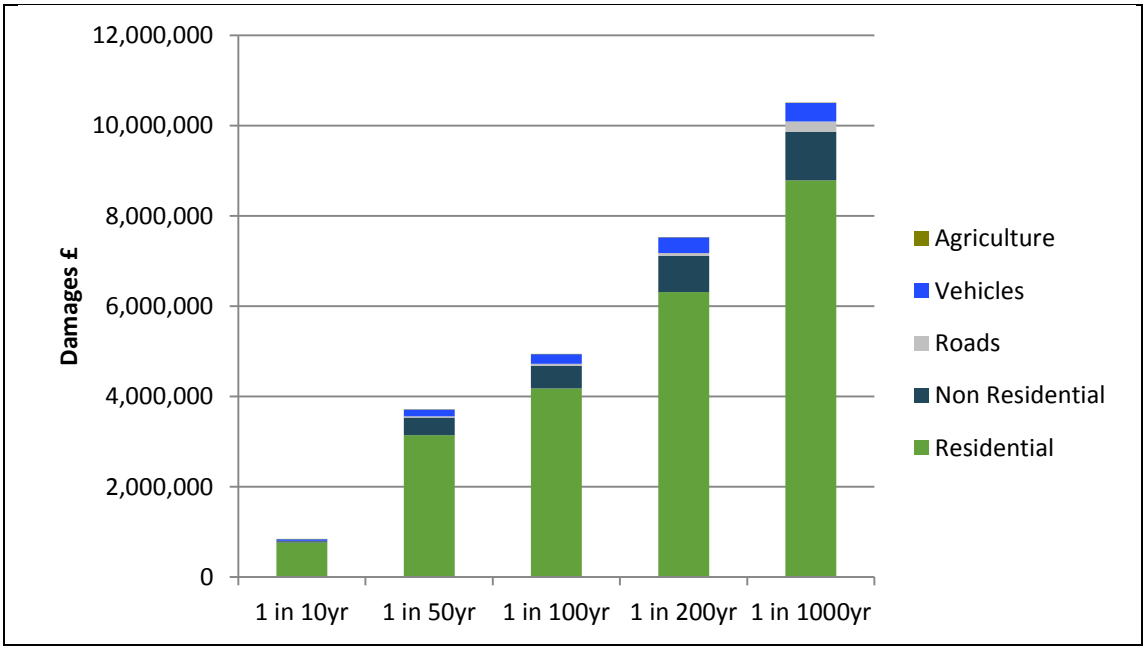


Figure 3: Damages by flood frequency

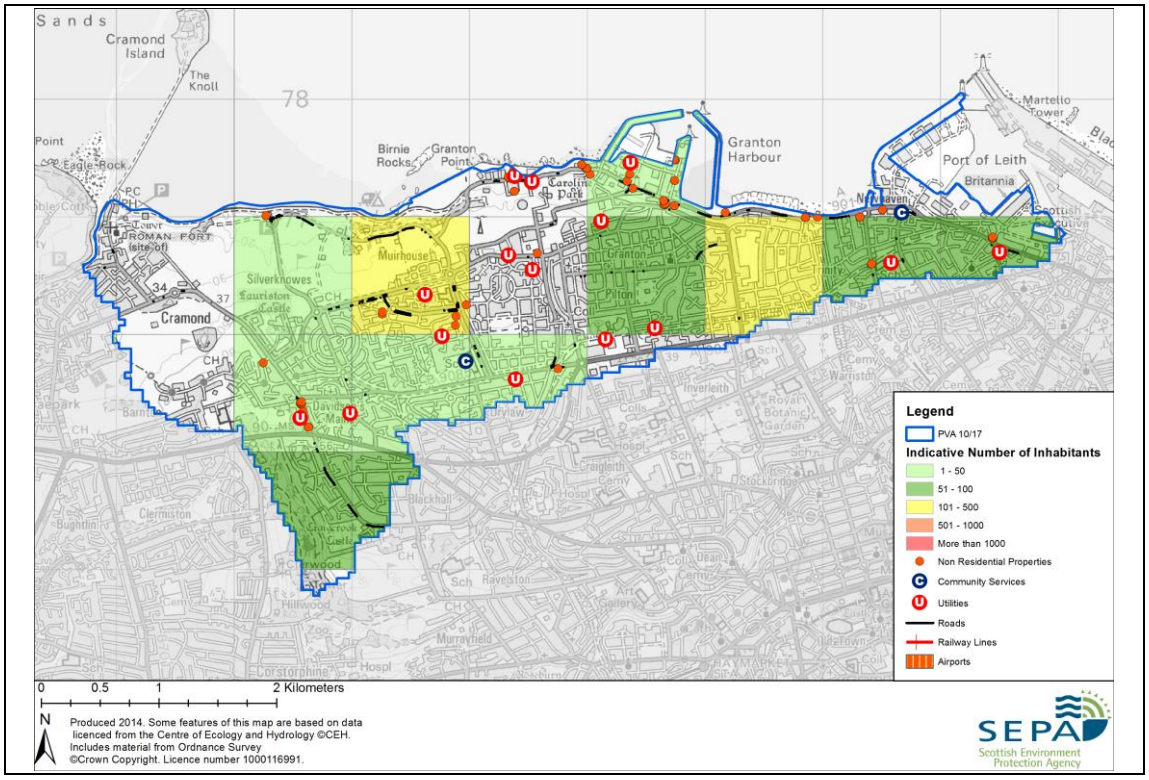


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following coastal floods have been identified as significant in this Potentially Vulnerable Area:

- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive flooding along the East Coast of Scotland, with the Firth of Forth being one of the worst affected areas. Locations within this coastal area affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads with Edinburgh City Council estimating the costs to repair damages in the region of £650,000;
- 17 October 1898: Newhaven Pier in Edinburgh washed away.

No significant river or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There are two flood warning target areas within this Potentially Vulnerable Area:

- Cramond - River flood warning, Almond;
- Granton and Leith - Coastal flood warning, Firth of Forth

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition, the following incentives or subsidies have been put in place to provide property owners with property level resilience/resistance actions:

- The City of Edinburgh Council owns 450m of temporary pallet barriers that can be utilised to protect properties from river flooding. The Council has 8,000 sandbags and there are a further 1,500 sandbags located in fire stations throughout the city which can be utilised by the public during flood events. The Council also operates Emergency Action Packs that are used to determine where people should be deployed during flood events.

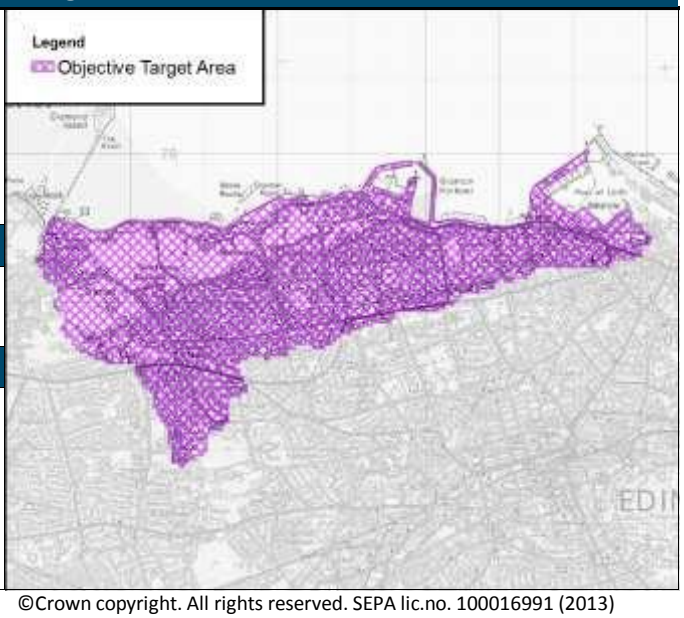
Cramond, Silverknowes, Granton Potentially Vulnerable Area 10/17 Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Cramond, Silverknowes and Granton	Accept coastal flooding in Cramond, Silverknowes and Granton is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding.	10095

Cramond, Silverknowes, Granton Potentially Vulnerable Area 10/17 Objectives and potential actions

Objective(s):	Cramond, Silverknowes & Granton objective target area
Accept coastal flooding in Cramond, Silverknowes and Granton is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding.	
Objective ID:	
10095	
Indicators:	
N/A	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100950100	*Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Site protection plans	100952100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

Cramond, Silverknowes, Granton (Potentially Vulnerable Area 10/17)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintenance of existing flood protection schemes - Coast	100950100	Ongoing maintenance of existing **coastal** defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	City of Edinburgh Council's revenue budget	City of Edinburgh Council
Edinburgh & Lothian Integrated Catchment Study	10052239	An integrated catchment study is being carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Ongoing. Results of study will be apparent by 2017.	Proportional funding of the study by appropriate Council's Revenue Budget and Scottish Water	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Surface Water Management Plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Proportional funding of the study by appropriate Council's Revenue Budget	City of Edinburgh Council and boundary local authorities
Flood Warning Schemes - Maintain **Almond** flood	100951800 100993211810	This action has been identified for all existing flood	Ongoing	The maintenance of SEPA's flood warning	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
warning scheme		warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.		service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Flood warning schemes – Maintain Firth of Forth and Tay **coastal** flood warning scheme	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood	Ongoing.	Self-funded.	Individuals, businesses, organisations or communities at risk of flooding.

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		risk.			
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council Emergency Services
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Site protection plans	100952100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to	Awareness raising from SEPA will help business owners determine their required protection levels.		Business owner

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		existing protection or resilience of the facility or the network.			
Flood warning schemes – Improve sign up of **Almond** flood warning scheme	100951800 100993211821	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Flood warning schemes – simplify **Almond** flood warning scheme	100993211830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Flood warning schemes – Improve sign up of Firth of Forth and Tay **coastal** flood warning scheme	100993491822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		FWTAs will be improved via a targeted communications campaign.	of those actions that are identified as being of priority are dependent on funding.	Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Flood warning schemes – Simplify Firth of Forth and Tay **coastal** flood warning scheme	100993491830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA

Water of Leith Catchment (Potentially Vulnerable Area 10/18)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	Midlothian Council, City of Edinburgh Council	Water of Leith

Background

This Potentially Vulnerable Area covers an area of 73km^2 and covers the lower reaches of the Water of Leith catchment (Figure 1). It includes central Edinburgh and suburban areas to the south west including Balerno, Currie and the foothills of the Pentland Hills. The main watercourses are the Water of Leith and its tributary, the Murray Burn. The Union Canal also flows through the Potentially Vulnerable Area.

The main source of flooding is river flooding (Figure 2). The highest risk of river flooding is from the Water of Leith and Murray Burn to Murrayfield, Roseburn and Sighthill. The highest risk of surface water flooding is in the Edinburgh urban area.

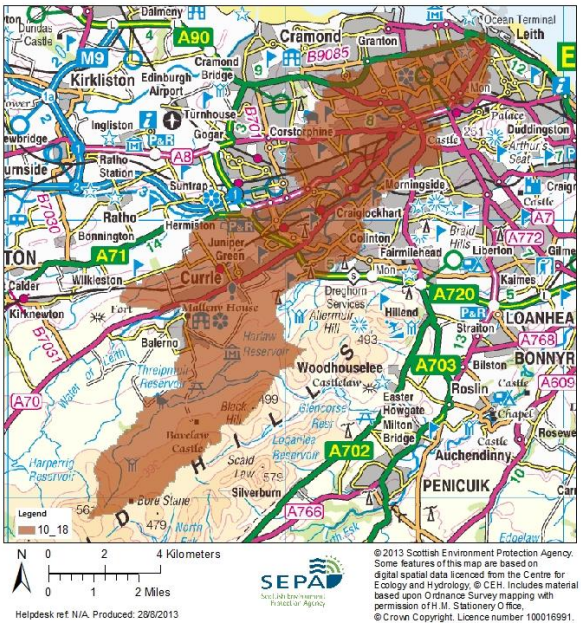


Figure 1: Water of Leith catchment Potentially Vulnerable Area

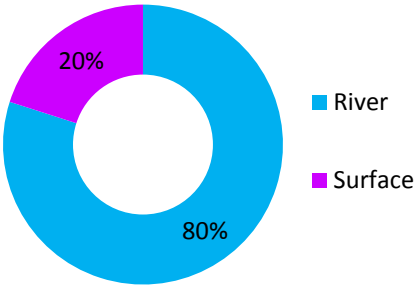


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 3,300 residential properties and 480 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from all sources of flooding can be seen in Table 1. A map showing the impacts of flooding from all sources during a medium likelihood event can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £5.7 million. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	390	3,300	7,000
No. of non-residential properties	70	480	920
No. of People	860	7,200	15,000
Community facilities	0	<10 Educational buildings <10 Emergency services buildings <10 Child day care centres <10 Care homes	<10 Educational buildings <10 Emergency services buildings <10 Child day care centres <10 Care homes
Utilities	10 Energy sites	60 Energy sites	80 Energy Sites <10 Communications sites
Transport links (excluding minor roads)	14 Roads affected at 90 locations • 11 A roads • 3 B roads 3 Railway routes affected at 29 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions • Carstairs to Edinburgh • Edinburgh Waverly to Glasgow Queen Street	15 Roads affected at 196 locations • 11 A Roads • 4 B roads 3 Railway routes affected at 45 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions • Carstairs to Edinburgh • Edinburgh Waverly to Glasgow Queen Street	15 Roads affected at 241 locations • 11 A roads • 4 B roads 3 Railway routes affected at 56 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions • Carstairs to Edinburgh • Edinburgh Waverly to Glasgow Queen Street
Environmental designated areas (km^2)	0.2km^2 • 1 SSSI	0.2km^2 • 1 SSSI	0.2km^2 • 1 SSSI
No. of cultural heritage sites	11	12	13
Agricultural land (km^2)	0.4 km^2	0.8 km^2	0.9 km^2

Table 1: Summary of flooding impacts

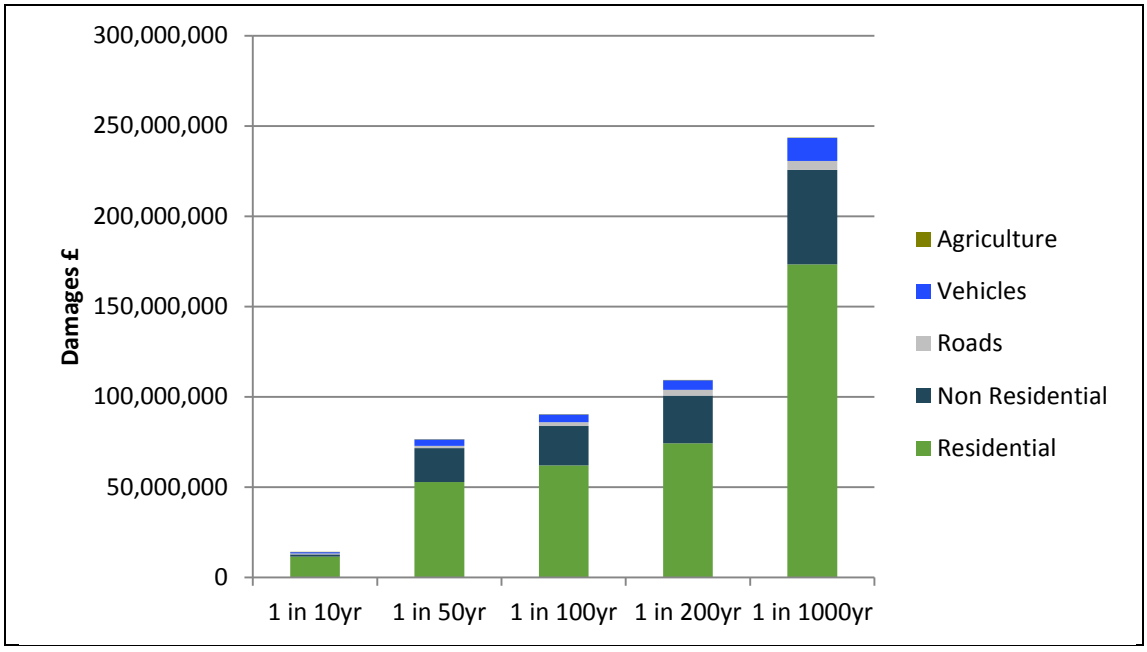


Figure 3: Damages by flood frequency

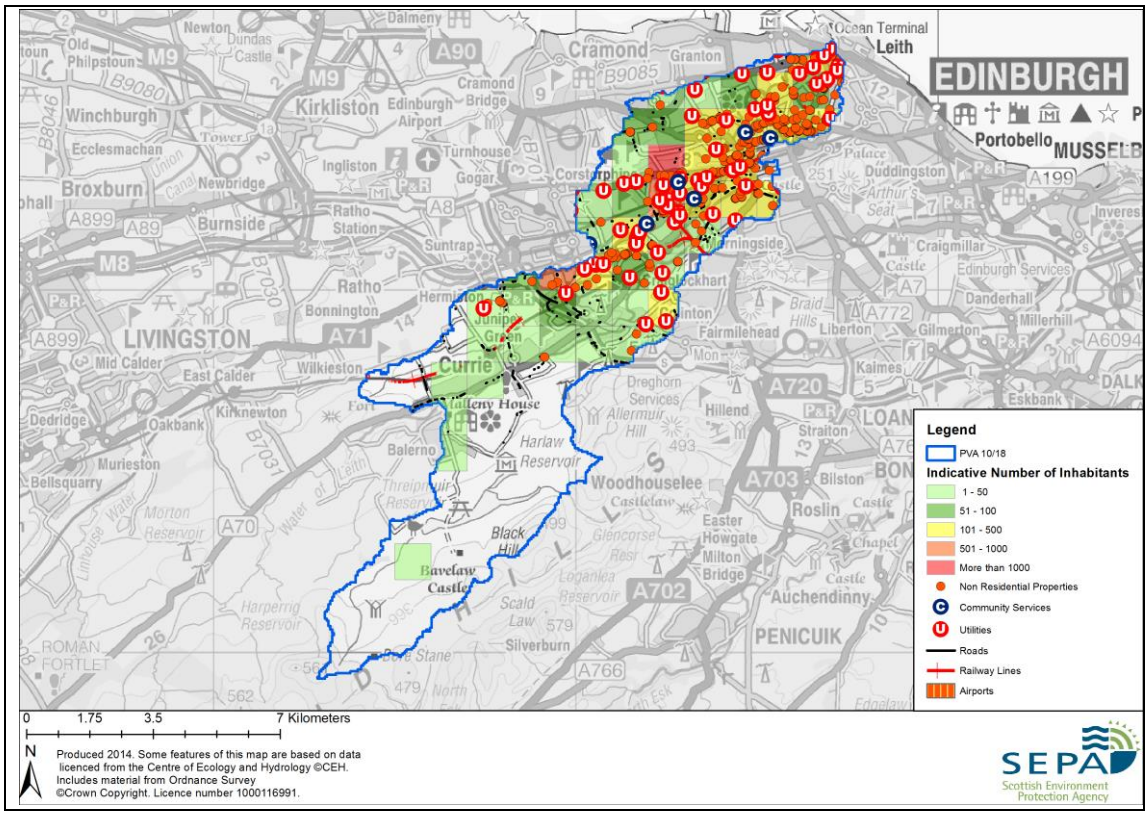


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river floods have been identified as significant in this Potentially Vulnerable Area:

- April 2000: Flooding on the Water of Leith caused boundary walls at Saughton, Balgreen, Stockbridge, Warriston and Bonnington to collapse resulting in the inundation of over 500 properties. Murrayfield Stadium, Murrayfield Ice Rink and 2 residential care homes also flooded. Estimated 1 in 180 year return period;
- 26 April 2000: Flooding from Braid Burn affected areas in and around Colinton and Portobello. Flood depth levels estimated to be greater than 2m in some areas;
- 6 October 1990: Flooding on the Water of Leith resulted in a peak flow of approximately 90 m^3/s. Flooding known to have occurred in multiple locations with the Roseburn area worst hit. Estimated 1 in 100 year return period;
- 3 November 1984: Flooding on the Water of Leith resulted in the inundation of 2 sheltered housing schemes. The Saughton and Roseburn areas were worst affected. Estimated 1 in 30 year return period;
- 15 October 1907: Water of Leith water levels at Currie 1.5m above normal levels resulting in the flooding of Woodhall Paper Mill at Juniper Green. Flooding contained at Cannonmills due to retaining walls however flood overtopped at Warriston Green causing road closures;
- 17 August 1907: Serious flooding within the Roseburn Park area of Edinburgh after the Water of Leith burst its banks. Flooding estimated to be as much as 2m in some areas.

The following surface water flood event has been identified as significant in this Potentially Vulnerable Area:

- 8 July 2011: Flooding of homes and businesses in Edinburgh. Balcarres Street in Morningside was identified as the area worst affected area with around 20 residential properties and 3 commercial properties flooding.

Summary of existing local actions to manage risk

There are three formal flood protection schemes to reduce the risk of flooding in this Potentially Vulnerable Area.

- Water of Leith (Roseburn) Flood Prevention Scheme. The scheme protects Roseburn area of Murrayfield. Standard of Protection was originally built to 1 in 100 year return period.
- Water of Leith Flood Protection Scheme (advanced works) includes management of Harperrig, Threipmuir and Harlow reservoirs to reduce flood risk on the Water of Leith.
- Water of Leith Flood Protection Scheme (phase 1) includes flood walls and embankments within Stockbridge, Bonnington, Vietch's Square and Warriston. The standard of protection is 1 in 200 year return period plus 12% additional protection for climate change predictions to 2054.

The City of Edinburgh Council is planning Phase 2 of the Water of Leith Flood Protection Scheme. This includes the protection of the Murrayfield and Roseburn areas. This has been confirmed by the Scottish Government and construction is due to start in 2014/15.

Other actions and natural features may also reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There are eight flood warning target areas within this Potentially Vulnerable Area:

- Longstone/Stenhouse - River flood warning, Water of Leith
- Roseburn - River flood warning, Water of Leith
- Stockbridge - River flood warning, Water of Leith
- Warriston - River flood warning, Water of Leith
- Bonnington - River flood warning, Water of Leith
- Colinton Mains - River flood warning, Braid Burn
- Dean Village - River flood warning, Water of Leith
- Granton and Leith - Coastal flood warning, Firth of Forth.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. This includes the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition, the City of Edinburgh Council owns 450m of temporary pallet barriers that can be utilised to protect properties from river flooding. The Council has 8,000 sandbags and there are a further 1,500 sandbags located in fire stations throughout the city which can be utilised by the public during flood events. The Council also operates Emergency Action Packs that are used to determine where people should be deployed during flood events.

Some local authorities have their own policies regarding property level protection. Contact your local authority or view their website for more information.

Information on flood hazard and risk data

The SEPA flood maps are indicative and of a strategic nature. There is inherent uncertainty in all flood modelling due to the assumptions and simplifications required to represent complex natural processes.

In the Water of Leith area the local authority has undertaken more detailed studies for the design and build of the Water of Leith flood protection scheme. The information in this report uses SEPA data which may be different from the more detailed flooding information held by the local authority arising from differences in modelling approach.

Water of Leith Catchment
Potentially Vulnerable Area 10/18
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Edinburgh	Accept flood risk in Edinburgh is managed appropriately. Maintain existing flood protection scheme (reservoir) that reduces economic damages to residential and non-residential properties in Edinburgh caused by flooding from the water of Leith.	10059
Edinburgh, between Bonnington and Veitch's Square (Water of Leith phase 1)	Accept flood risk in Edinburgh (between Bonnington and Veitch's Square) is managed appropriately. Maintain the Water of Leith flood protection scheme (phase 1) that reduces the risk of flooding.	10060
Edinburgh, between Veitch's Square and Murrayfield (Water of Leith phase 2)	Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh between Veitch's Square and Murrayfield caused by flooding from the Water of Leith (flood protection scheme phase 2, due for completion in 2017).	10061
Edinburgh, between Balgreen and Longstone (Water of Leith phase 3)	Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh, between Balgreen and Longstone caused by flooding from the Water of Leith (flood protection scheme phase 3).	10062
Edinburgh (Gorgie, Stenhouse, Saughton and Longstone)	Reduce risk to people from river flooding in Edinburgh (Gorgie, Stenhouse, Saughton and Longstone) caused by flooding from the Water of Leith.	10063

Water of Leith Catchment
Potentially Vulnerable Area 10/18
Objectives and potential actions

Objective(s):	Edinburgh objective target area
Accept flood risk in Edinburgh is managed appropriately. Maintain existing flood protection scheme (reservoir) that reduces economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Water of Leith.	
Objective ID:	
10059	
Indicators:	
Reduction in peak flow of 106 m^3/s	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100590100	Use of reservoirs in the upper catchment of the Water of Leith lower river water levels downstream reducing flood risk. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Site protection plans	100592100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

Water of Leith Catchment
Potentially Vulnerable Area 10/18
Objectives and potential actions

Objective(s):

Accept flood risk in Edinburgh (between Bonnington and Veitch's Square) is managed appropriately. Maintain the Water of Leith flood protection scheme (phase 1) that reduces the risk of flooding.

Objective ID:

10060

Indicators:

Protected to 1:200 year flood by flood protection scheme:
480 residential properties
80 non-residential properties
3 community facilities

Edinburgh, between Bonnington and Vieth's Square (Water of Leith Phase 1) objective target area

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100600100	Existing defences along the Water of Leith provide protection to residential and/or non-residential properties up to a 1 in 200 year flood. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Site protection plans	100602100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

Water of Leith Catchment
Potentially Vulnerable Area 10/18
Objectives and potential actions

Objective(s):

Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh between Veitch's Square and Murrayfield caused by flooding from the Water of Leith (flood protection scheme phase 2, due for completion 2017).

Objective ID:

10061

Indicators:

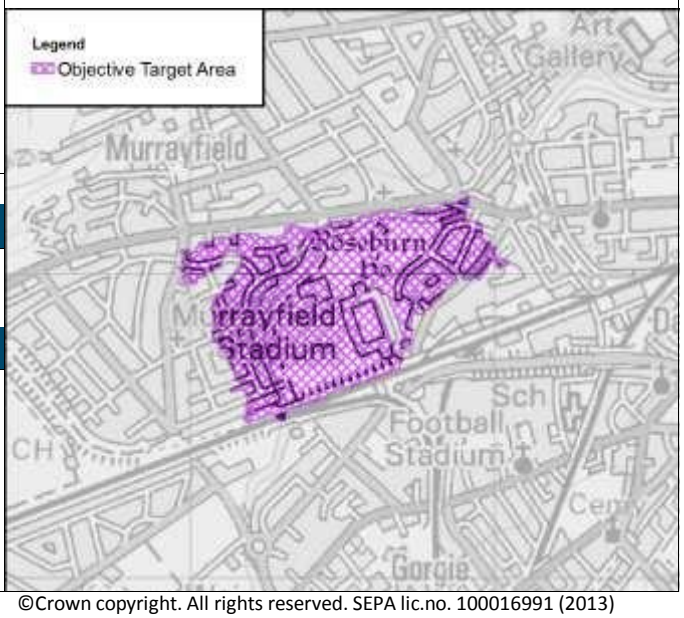
Protected by the proposed scheme (expected completion 2017):

440 residential properties

less than 10 non-residential properties

3 community facilities

Edinburgh, between Vieth's Square and Murrayfield (Water of Leith Phase 2) objective target area



Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100610100	Existing defences along the Water of Leith and upstream reservoirs provide protection to residential and/or non-residential properties between a 1 in 50 and 1 in 200 year flood. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Sediment management	100610700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100611100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Construction of direct flood defences	100611400	Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100611700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100612100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

Water of Leith Catchment
Potentially Vulnerable Area 10/18
Objectives and potential actions

Improved understanding	100612200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*
Relocation	100610200	Some of the properties that have been identified to be at risk of flooding may be suitable for relocation. *Relocation of properties or infrastructure may be applicable in locations where frequent flooding is expected and where areas may otherwise be difficult or uneconomical to protect.*

Water of Leith Catchment
Potentially Vulnerable Area 10/18
Objectives and potential actions

Objective(s):

Reduce risk to community facilities and economic damages to residential and non-residential properties in Edinburgh, between Balgreen and Longstone caused by flooding from the Water of Leith (phase 3).

Objective ID:

10062

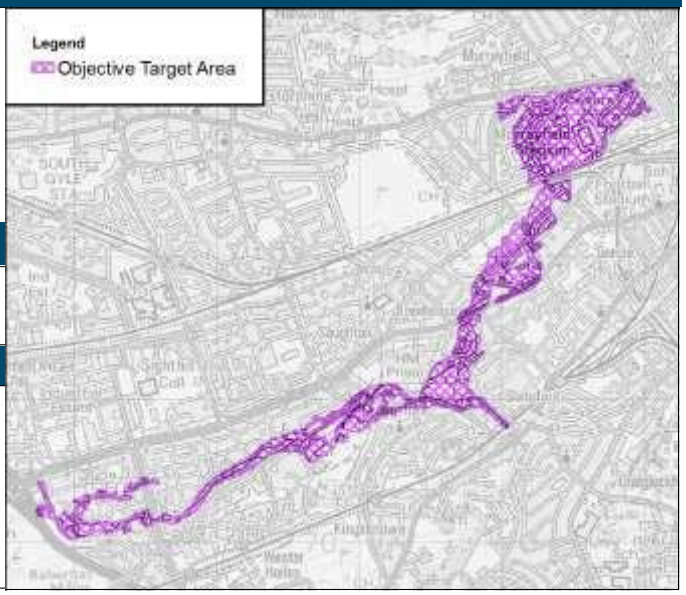
Indicators:

Proposed flood protection scheme will protect 73 residential properties and non-residential properties (from medium likelihood flood)

Edinburgh, between Balgreen and Longstone (Water of Leith Phase 3) objective target area

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100620100	Existing defences along the Water of Leith provide protection to residential and/or non-residential properties between a 1 in 50 and 100 year flood. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Sediment management	100620700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100621100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Construction of direct flood defences	100621400	Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100621700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100622100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100622200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Water of Leith Catchment
Potentially Vulnerable Area 10/18
Objectives and potential actions

Objective(s):	Edinburgh (Gorgie, Stenhouse, Saughton and Longstone) objective target area
Reduce risk to people from river flooding in Edinburgh (Gorgie, Stenhouse, Saughton and Longstone) caused by flooding from the Water of Leith.	
Objective ID:	
10063	
Indicators:	
5,000 people at risk (from a medium likelihood flood)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100630100	Existing defences along the Water of Leith provide protection to residential and/or non-residential properties between a 1 in 50 and 100 yearflood. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Sediment management	100630700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100631100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Construction of direct flood defences	100631400	Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Improved understanding	100632200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Delivery Plan for Consultation

Water of Leith Catchment (Potentially Vulnerable Area 10/18)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintenance of existing flood protection schemes - Reservoirs (Harlaw, Threipmuir and Harperrig)	100590100	**Use of reservoirs in the upper catchment of the Water of Leith lower river water levels downstream reducing flood risk.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	City of Edinburgh Council's revenue budget	City of Edinburgh Council
Maintenance of existing flood protection schemes Reservoirs - Phase 1 (Bonnington – Veitch's Square) - Phase 2 (on completion) (Rosefield / Murrayfield)	100600100 100610100 100630100	**Existing defences along the Water of Leith provide protection to residential and/or non-residential properties up to a 1 in 200 year event.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although	Ongoing	City of Edinburgh Council's revenue budget	City of Edinburgh Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		appropriate maintenance activities may vary.			
Construction of Direct flood Defences - Phase 2 (Rosefield / Murrayfield)	100611400	**Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.** Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.	Tenders will be sought for the construction of defences in the Murrayfield / Roseburn Area. Construction to commence in Spring 2016.	CEC Capital Investment Programme	City of Edinburgh Council
Sediment Management	100630700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas	A study of the Water of Leith Basin is to be undertaken during 2015/16.	City of Edinburgh Council revenue budget	City of Edinburgh Council
Flood warning schemes – Maintain **Water of Leith** flood warning scheme	100611800 100621800 100631800 100993461810	**This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local**	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		community. Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.		grant funding to enable SEPA to implement new flood warning schemes.	
Flood warning schemes – Maintain Firth of Forth and Tay **coastal** flood warning scheme	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Edinburgh & Lothian Integrated Catchment Study	10052239	An integrated catchment study **is being** carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Ongoing. Results of study will be apparent by 2017.	Proportional funding of the study by appropriate Council's Revenue Budget and Scottish Water	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council, Mid Lothian Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Surface Water Management Plan	10052238	The area **will** be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Proportional funding by appropriate Council's Revenue Budget	City of Edinburgh Council, Midlothian and boundary local authorities
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing.	Self-funded.	Individuals, businesses, organisations or communities at risk of flooding.
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council Emergency Services

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		minimise impacts where possible.			
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Construction of Direct flood Defences - Other Future Phases	100621400 100631400	**Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.** Direct defence actions	A Flood Order is in place for the Water of Leith and Planning Consent has been obtained. A programme for construction is yet to be put in place due to insufficient funds being available.		City of Edinburgh Council Scottish Government

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.			
Relocation of properties/infrastructure away from flood risk areas	100610200	**Some of the properties that have been identified to be at risk of flooding may be suitable for relocation.** Relocation of properties or infrastructure, currently at risk of flooding, away from the flood risk area may be applicable in locations where frequent flooding is expected to a limited area that may be otherwise difficult or uneconomical to protect.	Relocation is not currently a City of Edinburgh Council Policy. It is not intended to progress relocation in the period 2016-2021.		City of Edinburgh Council
Property level protection	100611700 100621700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction	Awareness raising from SEPA will help property owners determine their required protection levels.		Property owner

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		techniques which are resilient to flood water. It is most beneficial for flood depths <0.6m in areas of high probability flooding			
Sediment Management	100610700 100620700 100630700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Modification of Conveyance	100611100 100621100 100631100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Site protection plans	100592100 100602100 100612100 100622100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Awareness raising from SEPA will help business owners determine their required protection levels.		Property Owner

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Modelling and other assessments to improve knowledge of flood hazards and impacts	100612200 100622200 100632200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Flood warning schemes – Improve sign up of **Water of Leith** flood warning scheme	100993461822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Flood warning schemes – simplify **Water of Leith** flood warning scheme	100993461830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Flood warning schemes – Improve sign up of Firth of	100993491822	This action has been identified because the	Potential actions are drawn from a short list of	The maintenance of SEPA's flood warning	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Forth and Tay **coastal** flood warning scheme		sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Flood warning schemes – Simplify Firth of Forth and Tay **coastal** flood warning scheme	100993491830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Flood warning scheme – new flood warning	100994431800	**Develop new flood warning. Properties in Edinburgh upstream of Longstone affected by flooding from the Murray Burn.** The inclusion of these areas of potential hasn't taken into account the feasibility of offering a warning in each location	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		so they will be subject to further screening and analysis of technical, operational and financial feasibility.			

Braid Burn Catchment (Potentially Vulnerable Area 10/19)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	City of Edinburgh Council	Braid Burn

Background

This Potentially Vulnerable Area covers an area of 43km^2 and covers the whole of the Braid Burn catchment (Figure 1). It covers central Edinburgh and its suburbs to the south including Oxgangs, Prestonfield and Craigmillar. The main watercourse is the Braid Burn flowing through Colinton Mains, Oxgangs, Duddingston and Durham before discharging into the Firth of Forth at Portobello.

The main source of flooding is surface water (Figure 2). The risk of flooding from the Braid Burn is reduced by the Braid Burn Flood Protection Scheme.

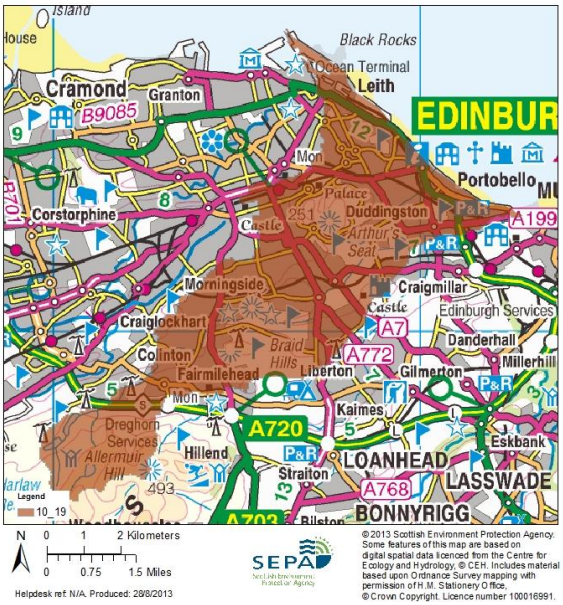


Figure 1: Braid Burn catchment Potentially Vulnerable Area

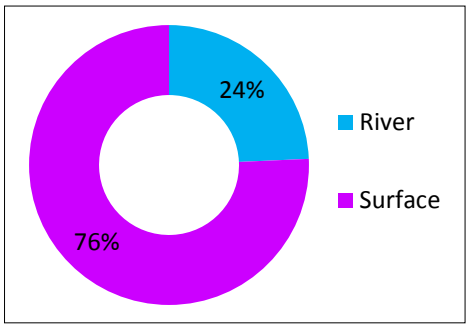


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 740 residential properties and 210 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts of flooding from all sources during a medium likelihood event can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £1.2 million. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties.

In 2010 Scottish Water carried out a Flood Risk Assessment Study of 292 water and wastewater assets across Scotland. Of the assets assessed, one wastewater asset was identified as being at risk of flooding within this Potentially Vulnerable Area.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	140	740	1,800
No. of non-residential properties	60	210	440
No. of people	310	1,600	3,900
Community facilities	0	<10 Educational buildings <10 Care homes	<10 Educational buildings <10 Care homes
Utilities	<10 Energy sites	20 Energy sites <10 Scottish Water assets	20 Energy sites <10 Communications sites <10 Scottish Water assets
Transport links (excluding minor roads)	11 roads affected at 53 locations • 10 A roads • 1 B roads 2 railway routes affected at 26 locations • Berwick-upon-Tweed to Edinburgh • Edinburgh Waverly to Glasgow Queen Street	14 roads affected at 132 locations • 12 A roads • 2 B roads 2 railway route affected at 36 locations • Berwick-upon-Tweed to Edinburgh • Edinburgh Waverly to Glasgow Queen Street	14 roads affected at 173 locations • 12 A roads • 2 B roads 2 railway route affected at 38 locations • Berwick-upon-Tweed to Edinburgh • Edinburgh Waverly to Glasgow Queen Street
Environmental designated Areas (km^2)	$0.5km^2$ • 2 SSSI • 2 SPA • 2 SAC	$0.6km^2$ • 2 SSSI • 2 SPA • 2 SAC	$0.6km^2$ • 2 SSSI • 2 SPA • 2 SAC
No. of cultural heritage sites	12	14	15
Agricultural land (km^2)	$0.5km^2$	$0.6km^2$	$0.7km^2$

Table 1: Summary of flooding impacts

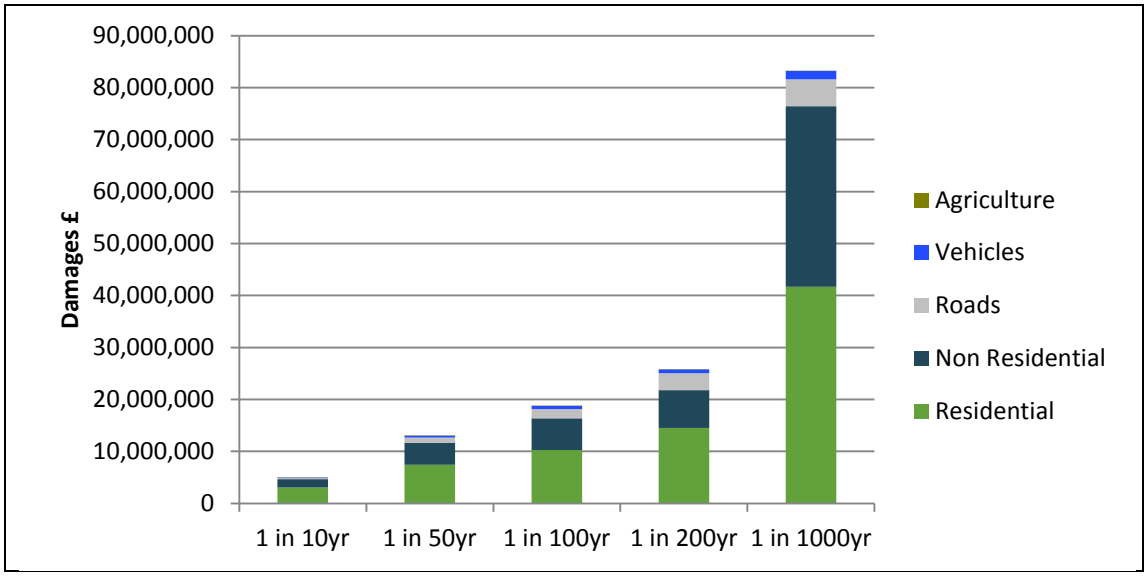


Figure 3: Damages by flood frequency

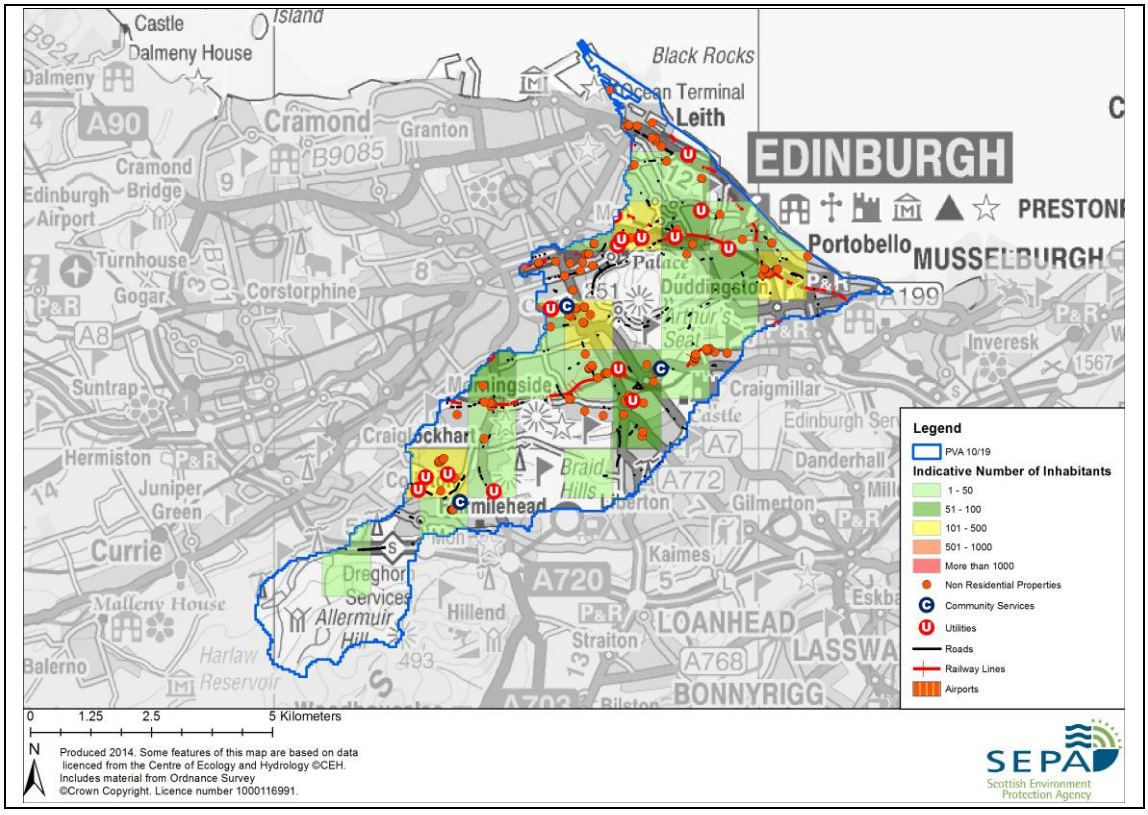


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following coastal floods have been identified as significant in this Potentially Vulnerable Area:

- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive flooding along the East Coast of Scotland, with the Firth of Forth being one of the worst affected areas. Locations within this coastal area affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads with Edinburgh City Council estimating the costs to repair damages in the region of £650,000;
- 4 April 1958: Portobello Promenade and nearby houses were flooded during this event;
- 1877: Sea wall washed away between Portobello and Joppa.

The following surface water flood event has been identified as significant in this Potentially Vulnerable Area:

- 8 July 2011: Flooding of homes and businesses in Edinburgh. Balcarres Street in Morningside was identified as the worst affected area with around 20 residential properties and 3 commercial properties flooded. The majority of the residential properties flooded were tenement buildings and only the ground floor properties have been counted.

The following river floods have been identified as significant in this Potentially Vulnerable Area:

- 8 November 2000: The Water of Leith, River Almond, Braid Burn and Gogar Burn. Flooding on the Water of Leith casued boundary walls at Saughton, Balgreen, Stockbridge, Warriston and Bonnington to collapse reuslting in the innundation of over 500 properties, Murrayfield Statium, Murrayfield Ice Rink and two residential care homes. High water levels also caused flooding at Edinburgh Airport and Kirkliston;
- 26 April 2000: Braid Burn. Areas from Colinton to Portobello flooded to an estimated depth of greater than 2m in some areas.

Summary of existing local actions to manage risk

The Braid Burn Flood Protection Scheme reduces the risk of river flooding in this Potentially Vulnerable Area. Other actions and natural features may also reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There are eight flood warning target areas within this Potentially Vulnerable Area:

- Colinton Mains - River flood warning, Braid Burn
- Mid Liberton - River flood warning, Braid Burn
- Cameron Toll - River flood warning, Braid Burn
- Portobello - River flood warning, Braid Burn
- The Inch Park - River flood warning, Braid Burn
- The Inch Park (Island Area) - River flood warning, Braid Burn
- Granton and Leith - Coastal flood warning, Firth of Forth and Tay
- Portobello Esplanade - Coastal flood warning, Firth of Forth and Tay

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. This includes the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition, the City of Edinburgh Council owns 450m of temporary pallet barriers that can be utilised to protect properties from river flooding. The Council has 8,000 sandbags and there are a further 1,500 sandbags located in fire stations throughout the City which can be utilised by the public during flood events. The Council also operates Emergency Action Packs that are used to determine where people should be deployed during flood events. This includes drawings, maps and sandbag constructions drawings. The Council has also issued properties on Balcarres Street with door and vent flood guards.

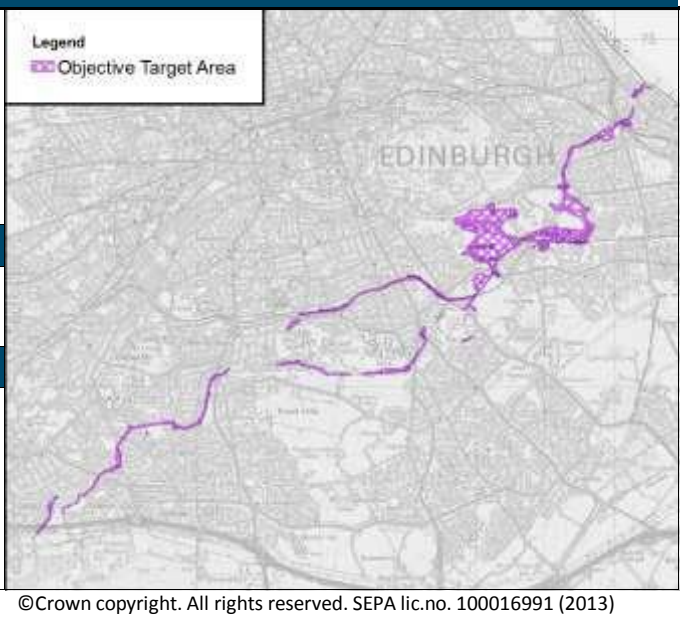
Braid Burn Catchment
Potentially Vulnerable Area 10/19
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

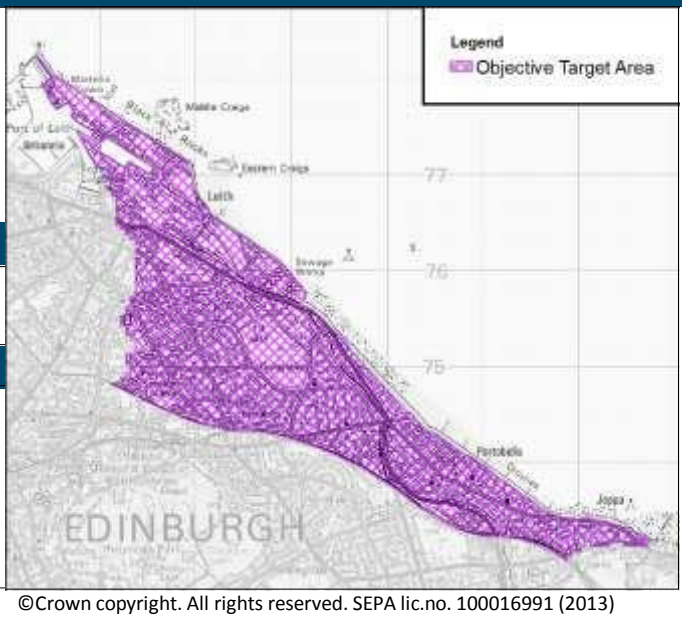
Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Edinburgh	Accept that flood risk in Edinburgh is managed appropriately. Maintain existing flood protection scheme that reduces risk to residential, non-residential and community properties in Edinburgh caused by flooding from the Braid Burn.	10067
Leith and Portobello	Accept coastal flooding in Leith and Portobello is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding.	10068

Braid Burn Catchment
Potentially Vulnerable Area 10/19
Objectives and potential actions

Objective(s):	Edinburgh objective target area
Accept that flood risk in Edinburgh is managed appropriately. Maintain existing flood protection scheme that reduces risk to residential, non-residential and community properties in Edinburgh caused by flooding from the Braid Burn.	
Objective ID:	
10067	
Indicators:	
950 residential properties, 30 non-residential properties and 12 community facilities protected from a medium likelihood flood.	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100670100	Existing defences along the Braid Burn provide protection to residential and/or non-residential properties from medium likelihood flood. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Site protection plans	100672100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

Braid Burn Catchment
Potentially Vulnerable Area 10/19
Objectives and potential actions

Objective(s):	Leith & Portobello objective target area
Accept coastal flooding in Leith and Portobello is managed appropriately. Maintain existing actions that protect residential and non-residential properties from coastal flooding.	
Objective ID:	
10068	
Indicators:	
N/A	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100680100	Existing defences along the coast provide protection to residential and/or non-residential properties. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Site protection plans	100682100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

Braid Burn Catchment (Potentially Vulnerable Area 10/19)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintenance of existing flood protection schemes - River - Reservoirs	100670100	**Existing defences along the Braid Burn provide protection to residential and/or non-residential properties up to a 1 in 200 year event.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	City of Edinburgh Council's revenue budget	City of Edinburgh Council
Maintenance of existing flood protection schemes - Coast	100680100	**Existing defences along the coast provide protection to residential and/or non-residential properties.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	City of Edinburgh Council's revenue budget and individual property owners	City of Edinburgh Council and individual property owners
Flood warning schemes –	100671800	**This action has been**	Ongoing	The maintenance of	SEPA

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Maintain **Braid Burn** flood warning scheme	100681800 100993231810	**identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.** Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduce by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.		SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Flood warning schemes – Maintain Firth of Forth and Tay **coastal** flood warning scheme	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Edinburgh & Lothian Integrated Catchment Study	10052239	An integrated catchment study is being carried out to improve knowledge and understanding of surface water flood risk and interactions with other	Ongoing. Results of study will be apparent by 2017.	Proportional funding of the study by appropriate Council's Revenue Budget and Scottish Water	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council, Mid Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		sources of flooding e.g. with the sewer network, watercourses and the sea.			
Surface Water Management Plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Proportional funding by appropriate Council's Revenue Budget	City of Edinburgh Council and boundary local authorities
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing.	Self-funded.	Individuals, businesses, organisations or communities at risk of flooding.
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council Emergency Services

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing.	City of Edinburgh Council's revenue budget	City of Edinburgh Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Site protection plans	100672100 100682100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Awareness raising from SEPA will help business owners determine their required protection levels.		Business owner
Modelling and other assessments to improve knowledge of flood hazards and impacts	100952200		Should the need for modelling be required, following inspections or after a flood event, funding will be explored.		City of Edinburgh Council
Flood warning schemes – Improve sign up of **Braid**	100993231822	This action has been identified because the sign-	Potential actions are drawn from a short list of	The maintenance of SEPA's flood warning	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Burn flood warning scheme		up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Flood warning schemes – simplify **Braid Burn** flood warning scheme	100993231830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Flood warning schemes – Improve sign up of Firth of Forth and Tay **coastal** flood warning scheme	100993491822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Flood warning schemes –	100993491830	This action has been	Potential actions are	The maintenance of	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Simplify Firth of Forth and Tay **coastal** flood warning scheme		identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	

Niddrie/Burdiehouse Burn Catchment (Potentially Vulnerable Area 10/20)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	Midlothian Council, City of Edinburgh Council, East Lothian Council	Niddrie / Burdiehouse Burn Catchment

Background

This Potentially Vulnerable Area covers an area of 26km^2 and includes the whole of the Niddrie / Burdiehouse Burn catchment (Figure 1). It covers the south and east areas of Edinburgh including Brunstane, Niddrie, Burdiehouse and Fairmilehead (Figure 1). The main watercourse is the Burdiehouse Burn which changes name to the Niddrie Burn and Brunstane Burn in the lower reaches where it flows into the Firth of Forth.

The main source of flooding is river flooding (Figure 2). The highest risk of river flooding is in the Eastfield, Niddrie, Moredun and Burdiehouse areas from the Niddrie / Burdiehouse Burn. The highest risk of surface water flooding is in the Fairmilehead, Burdiehouse and Niddrie areas.

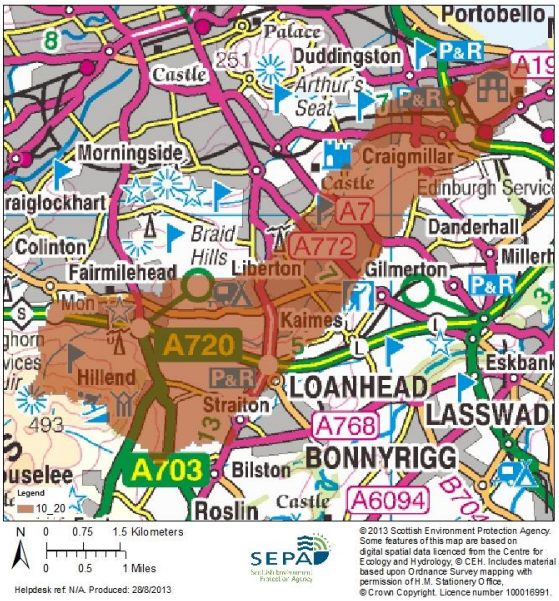


Figure 1: Niddrie/Burdiehouse Burn catchment Potentially Vulnerable Area

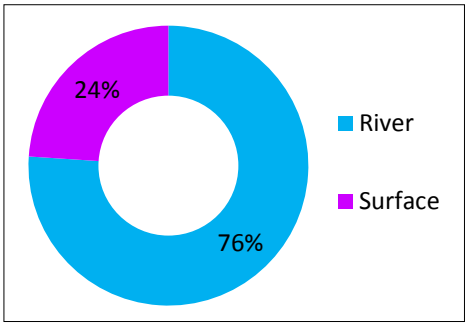


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 870 residential properties and 50 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts of flooding from all sources during a medium likelihood event can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £1.6 million. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	340	870	1,000
No. of non-residential properties	20	50	70
No. of People	750	1,900	2,200
Community facilities	<10 Educational buildings <10 Child day care centres	<10 Educational buildings <10 Child day care centres	<10 Educational buildings <10 Child day care centres
Utilities	<10 Energy sites	10 Energy sites	10 Energy sites
Transport links (excluding minor roads)	12 Roads affected at 75 locations • 10 A roads • 2 B roads 1 Railway route affected at 1 location • Berwick-upon-Tweed to Edinburgh	12 Roads affected at 124 locations • 10 A roads • 2 B roads 1 Railway route affected at 2 locations • Berwick-upon-Tweed to Edinburgh	12 Roads affected at 137 locations • 10 A roads • 2 B roads 1 Railway route affected at 3 locations • Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km^2)	0.1km^2 • 1 SSSI • 1 SPA • 1 SAC	0.1km^2 • 1 SSSI • 1 SPA • 1 SAC	0.1km^2 • 1 SSSI • 1 SPA • 1 SAC
No. of cultural heritage sites	2	3	3
Agricultural land (km^2)	0.6km^2	0.8km^2	0.8km^2

Table 1: Summary of flooding impacts

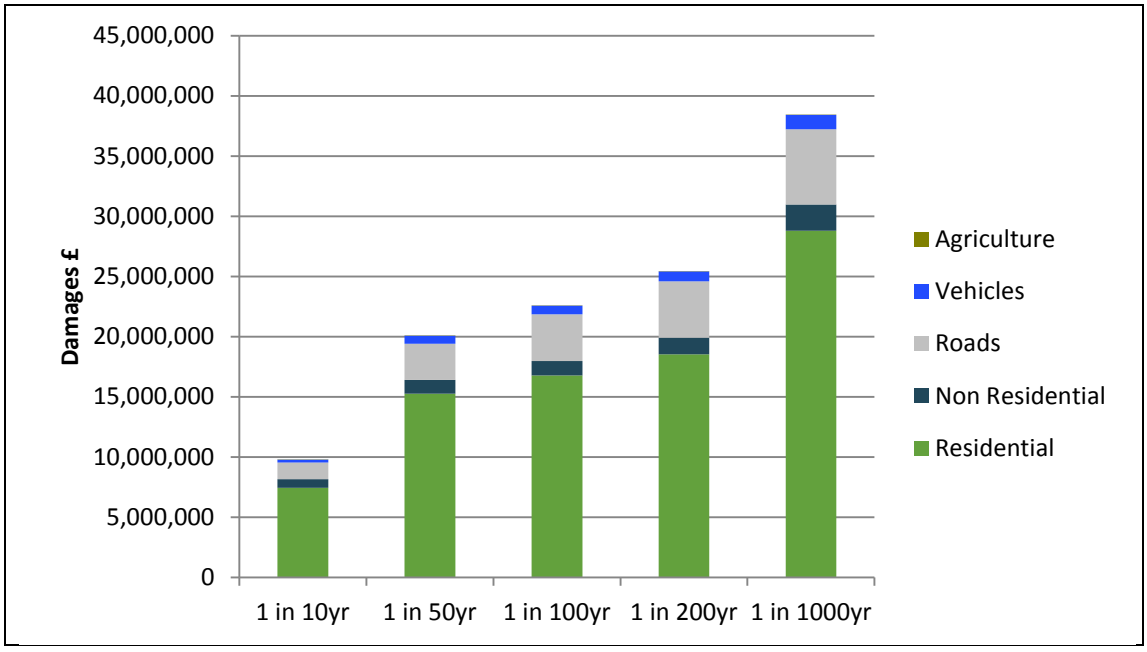


Figure 3: Damages by flood frequency

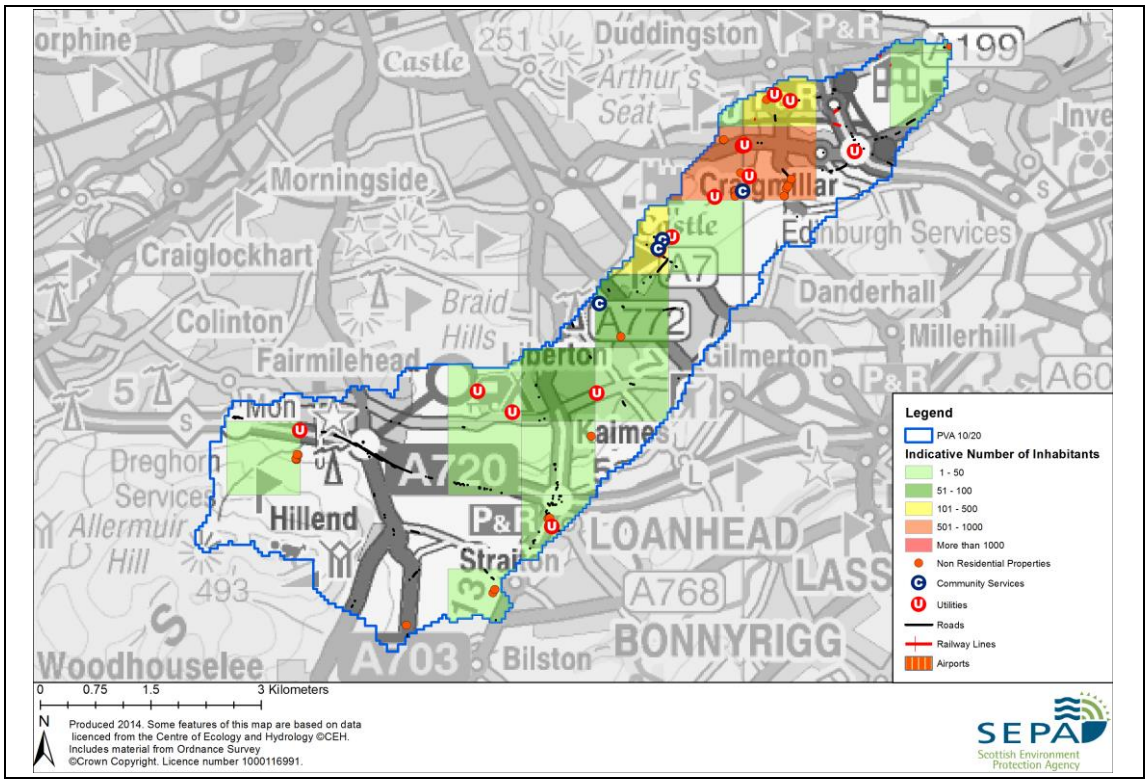


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

No significant river, coastal or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may exist that reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There are two flood warning target areas within this Potentially Vulnerable Area:

- Portobello Esplanade - Coastal flood warning, Firth of Forth
- Musselburgh Coastal - Coastal flood warning, Firth of Forth.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. This includes the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition, the City of Edinburgh Council owns 450m of temporary pallet barriers that can be utilised to protect properties from river flooding. The Council has 8,000 sandbags and there are a further 1,500 sandbags located in fire stations throughout the city which can be utilised by the public during flood events. The Council also operates Emergency Action Packs that are used to determine where people should be deployed during flood events.

Some local authorities have their own policies regarding property level protection. Contact your local authority or view their website for more information.

Information on Flood Hazard and Risk Data

The SEPA flood maps are indicative and of a strategic nature. There is inherent uncertainty in all flood modelling due to the assumptions and simplifications required to represent complex natural processes.

In this Potentially Vulnerable Area there is less confidence in the SEPA flood maps as it does not compare well with known flood events. SEPA and the City of Edinburgh Council are working to improve the confidence of the flood maps in this area.

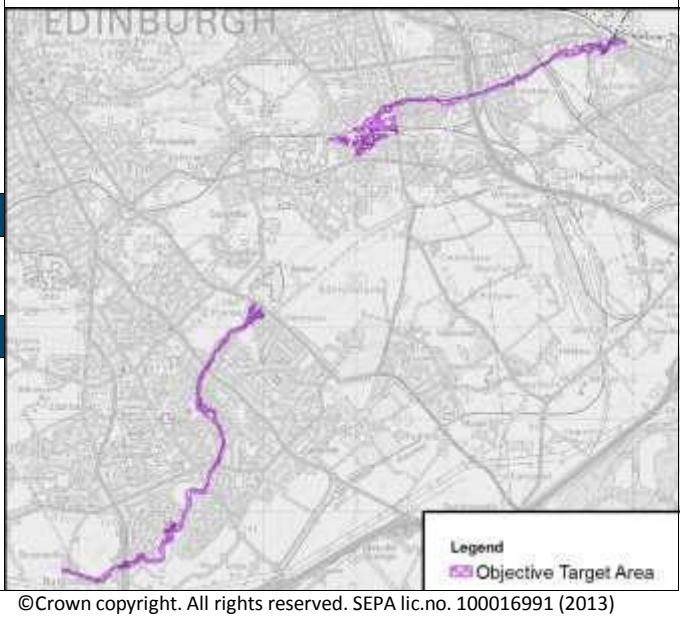
Niddrie/ Burdiehouse Burn Catchment Potentially Vulnerable Area 10/20 Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Edinburgh	Reduce economic damages to residential and non-residential properties in Edinburgh / Burdiehouse caused by flooding from the Niddrie Burn. Reduce risk to people in Edinburgh / Burdiehouse from flooding from the Niddrie Burn.	10071 10072

Niddrie/ Burdiehouse Burn Catchment
Potentially Vulnerable Area 10/20
Objectives and potential actions

Objective(s):	Edinburgh objective target area
Reduce economic damages to residential and non-residential properties in Edinburgh/ Burdiehouse caused by flooding from the Niddrie Burn. Reduce risk to people in Edinburgh/ Burdiehouse from flooding from the Niddrie Burn.	
Objective ID:	
10071, 10072	
Indicators:	
£1.1 million annual average damages (residential properties) £72,000 annual average damages (non-residential properties) 7,600 people at risk (from a medium likelihood flood) 1 child day care centre	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100710100	Maintenance of flood control structure and flood storage area at river restoration site is required. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Sediment management	100710700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of online and offline storage	100711000	Upstream of Edinburgh land with the potential to be used for online or offline storage has been identified. This could offer a reduction in flood risk along the Burdiehouse Burn for medium likelihood floods. *Flood storage actions retain water in the upper catchment or away from the watercourse, reducing the level and flow in the river. The benefit of these actions decreases further downstream although they can be designed to benefit multiple communities.*
Modification of conveyance	100711100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Installation / modification of river control structures	100711200	*Control structures on a river can reduce flood levels either by restricting or increasing flow in the channel. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.*
Construction of direct flood defences	100711400	Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*

Property level protection	100711700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100712100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100712200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Niddrie / Burdiehouse Burn Catchment (Potentially Vulnerable Area 10/20)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintenance of existing flood protection schemes	100710100 100720100	**Maintenance of flood control structure and flood storage area at river restoration site is required.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	City of Edinburgh Council's revenue budget	City of Edinburgh Council
Edinburgh & Lothian Integrated Catchment Study	10052239	An integrated catchment study **is being** carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Ongoing. Results of study will be apparent by 2017.	Proportional funding of the study by appropriate Council's Revenue Budget and Scottish Water	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Surface Water Management Plan	10052238	The area **will** be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions	Ongoing. Results of study will be apparent by 2015.	Proportional funding by appropriate Council's Revenue Budget	City of Edinburgh Council, Midlothian, East Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		to achieve the objectives.			
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing.	Self-funded.	Individuals, businesses, organisations or communities at risk of flooding.
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing.	Proportional funding by appropriate Council's Revenue Budget	City of Edinburgh Council Midlothian Council East Lothian Council Emergency Services
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Proportional funding by appropriate Council's Revenue Budget	City of Edinburgh Council Midlothian Council East Lothian Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within	Ongoing.	Proportional funding by appropriate Council's Revenue Budget	City of Edinburgh Council Midlothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.			East Lothian Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Sediment Management	100710700 100720700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Construction of Online and Offline storage	100711000 100721000	**Upstream of Edinburgh land with the potential to be used for online or offline storage has been identified. This could offer a reduction in flood risk along the Burdiehouse Burn for medium likelihood events.** Flood storage actions retain water in the upper catchment or away from the channel, to reduce level and flow in the river. The benefit of these actions decreases further downstream although they	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		can be designed to benefit multiple communities.			
Modification of Conveyance	100711100 100721100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Installation / modification of fluvial control structures	100711200 100721200	Fluvial control structures can reduce flood levels to a target area by either restricting or increasing channel flow. The impact of these structures can vary significantly depending on type and location of the structures being added or modified	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Construction of Direct flood Defences	100711400 100721400	**Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.** Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		and the receptors at flood risk.			
Property level protection	100711700 100721700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths <0.6m in areas of high probability flooding	Awareness raising from SEPA will help property owners determine their required protection levels.		Property owner
Flood warning schemes	100711800 100721800 100994410	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduce by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding. The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.		SEPA
Site protection plans	100712100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or	Raising awareness of vulnerable sites through provision of council and SEPA data will help business owners determine their required protection levels.		Business owner

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		resilience of the facility or the network.			
Modelling and other assessments to improve knowledge of flood hazards and impacts	100712200 100722200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	If the potential action is found by SEPA and their contractors to be technically viable the City of Edinburgh has no funding available to explore this at present. Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding settlement from the Scottish Government.		City of Edinburgh Council Midlothian Council

Musselburgh (Potentially Vulnerable Area 10/21)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	City of Edinburgh Council, East Lothian Council	Edinburgh Coastal

Background

This Potentially Vulnerable Area covers an area of 12km^2 and is part of the Almond and Edinburgh Group catchment. This is a small sized, partially urbanised area in the north east of the catchment covering Musselburgh (Figure 1). Its main watercourse is the River Esk which passes through the centre of Musselburgh before discharging into the Firth of Forth at Fisherrow Sands.

The majority of damages are caused by river flooding (Figure 2). The highest risk of river flooding is from the River Esk to Musselburgh. The highest risk of coastal flooding is from the Firth of Forth to Musselburgh and Inveresk. The highest risk of surface water flooding is in Wallyford and Pinkie Brae (Musselburgh).

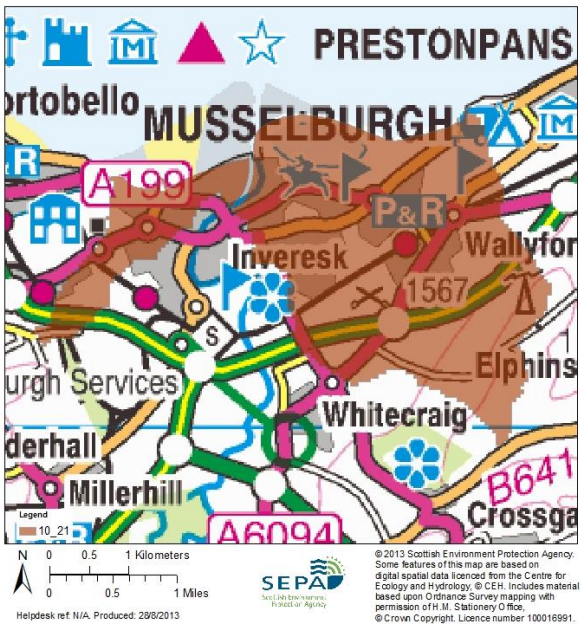


Figure 1: Musselburgh Potentially Vulnerable Area

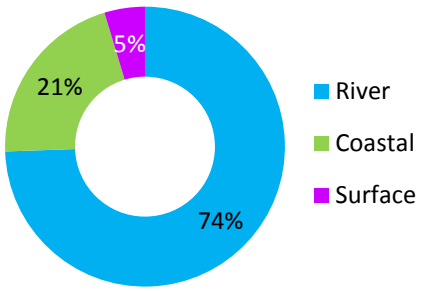


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 1,300 residential properties and 270 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1 and a map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £3.2 million. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest

damages are to residential properties followed by damages to non-residential properties.

In 2010 Scottish Water carried out a Flood Risk Assessment Study of water and wastewater assets across Scotland. Of the assets assessed, one wastewater asset was identified as being at risk of flooding within this Potentially Vulnerable Area.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	280	1,300	1,600
No. of non-residential properties	60	270	320
No. of people	620	2,800	3,500
Community facilities	<10 Educational buildings <10 Care homes	<10 Educational buildings <10 Care homes	<10 Educational buildings <10 Care homes
Utilities	<10 Energy sites	~10 Energy sites <10 Scottish Water assets	~10 Energy sites <10 Scottish Water assets
Transport links (excluding minor roads)	7 Roads affected at 26 locations • 5 A roads • 2 B roads 1 Railway route affected at 6 locations • Berwick-upon-Tweed to Edinburgh	7 Roads affected at 83 locations • 5 A roads • 2 B roads 1 Railway route affected at 11 locations • Berwick-upon-Tweed to Edinburgh	8 Roads affected at 106 locations • 5 A roads • 3 B roads 1 Railway route affected at 11 locations • Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km^2)	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC	0.3km^2 • 1 SSSI • 1 SPA • 1 SAC
No. of cultural heritage sites	9	10	10
Agricultural land (km^2)	0.3km^2	0.6km^2	0.7km^2

Table 1: Summary of flood impacts from all sources

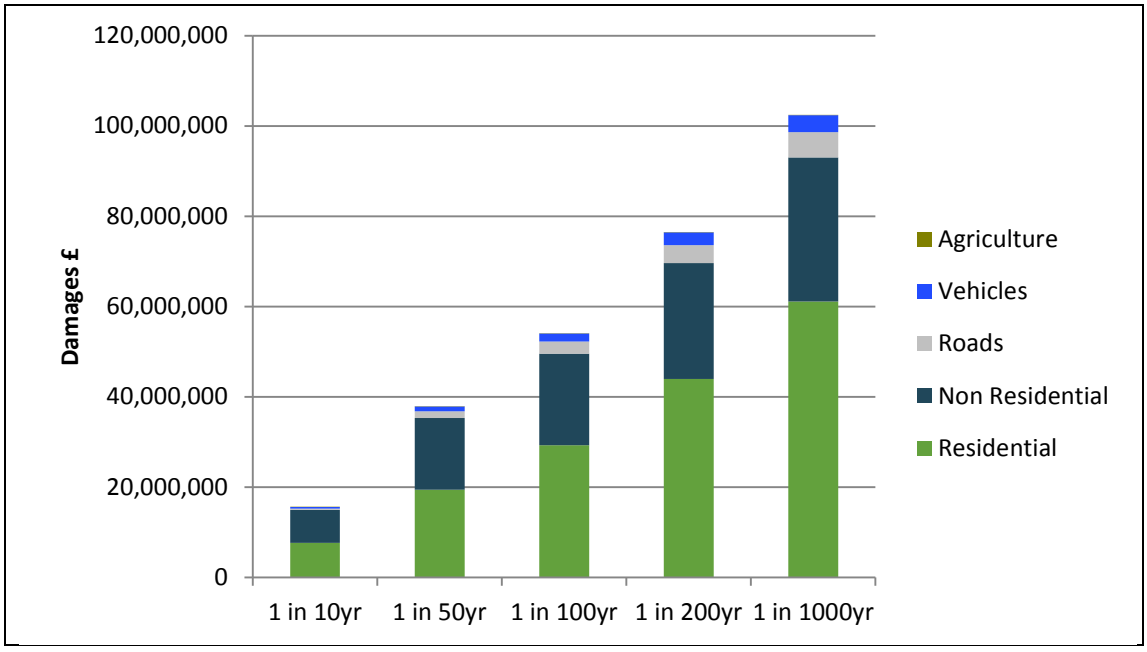


Figure 3: Damages by flood frequency

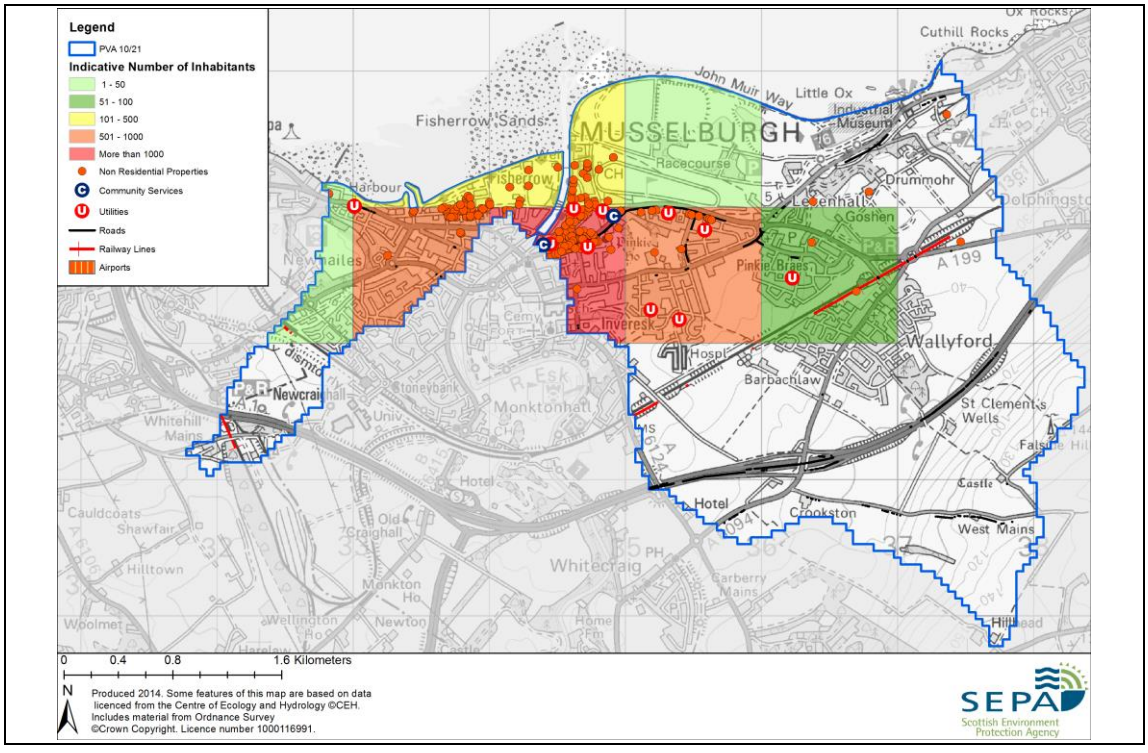


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river flood event has been identified as significant in this Potentially Vulnerable Area:

- 13 August 1948, River Esk: Evacuation required in Musselburgh after flooding occurred in Eskside West, Eskside East, Shorthope Street, Millhill and areas of the High Street.

The following coastal flood event has been identified as significant in this Potentially Vulnerable Area:

- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive flooding along the East Coast of Scotland, with the Firth of Forth being one of the worst affected areas. Locations within this coastal area affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads with Edinburgh City Council estimating the costs to repair damages in the region of £650,000.

In addition to the above, there is a history of groundwater flooding in Musselburgh, particularly around the Pinkie area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There are three flood warning target areas within this Potentially Vulnerable Area:

- Musselburgh - River flood warning, Esk;
- Portobello Esplanade - Coastal flood warning, Firth of Forth;
- Musselburgh Coastal - Coastal flood warning, Firth of Forth.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following community groups are known to help with flood resilience within this Potentially Vulnerable Area:

- East Lothian Bio-diversity Group;
- East Lothian Tenants and Residents Panel;
- Musselburgh Waterfront Group;
- Musselburgh and Inveresk Community Council.

Numerous local community councils also operate throughout the East Lothian Council.

The following local incentives or subsidies have been put in place in order to provide property owners with property level resilience/resistance measures:

- The City of Edinburgh Council owns 450m of temporary pallet barriers that can be utilised to protect properties from river flooding. In addition to this, the Council has 8,000 sandbags and there are a further 1,500 sandbags located in fire stations throughout the city which can be utilised by the public during

flood events. The Council also operates Emergency Action Packs that are used to determine where people should be deployed during flood events. This includes drawings, maps and sandbag construction drawings;

- East Lothian Council strategically deploy temporary flood barriers and sand bags when properties are threatened by flooding.

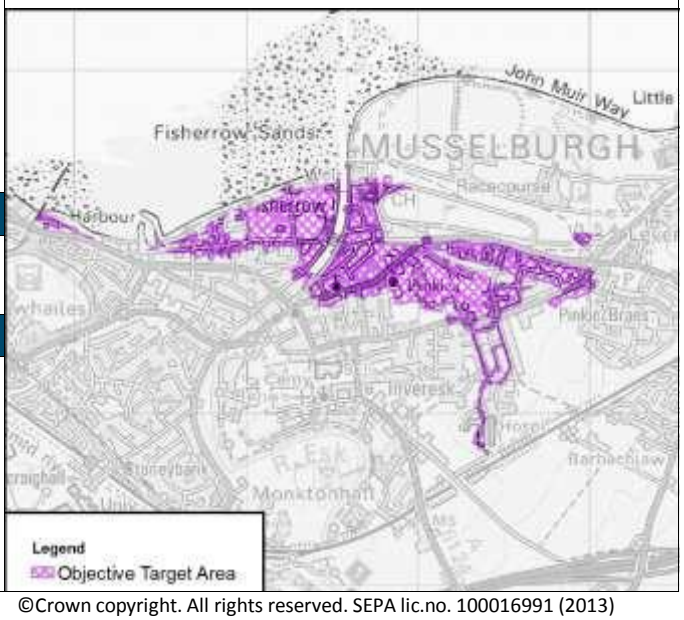
Musselburgh
Potentially Vulnerable Area 10/21
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local District Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Musselburgh	Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk and coastal flooding. Reduce risk to people in Musselburgh from flooding from the River Esk.	10075 10076

Musselburgh
Potentially Vulnerable Area 10/21
Objectives and potential actions

Objective(s):	Musselburgh objective target area
Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk and coastal flooding. Reduce risk to people in Musselburgh from flooding from the River Esk.	
Objective ID:	
10075, 10076	
Indicators:	
£1.6 million annual average damages (residential properties) 1.2 million annual average damages (non-residential properties) 2,800 people at risk (from a medium likelihood flood) 1 care home	

Potential action	Action ID	Description
Sediment management	100750700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Wave attenuation	100750800	*Wave attenuation uses the natural characteristics of coastal land cover either to reduce the impact of waves and coastal erosion, or to act as a physical barrier to tidal waters.*
Construction of direct flood defences	100751400	Within Musselburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100751700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100752100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100752200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Musselburgh (North) (Potentially Vulnerable Area 10/21)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintain Esk flood warning scheme	100993291810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Maintain Firth of Forth flood warning scheme	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Surface water management plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Proportional funding by appropriate Council's Revenue Budgets	City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Edinburgh & Lothians Integrated catchment study	10052239	An integrated catchment study is being carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of	Ongoing. Results of study will be apparent by 2017.	Proportional funding of the study by appropriate Council's Revenue Budget and Scottish Water	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council,

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		flooding e.g. with the sewer network, watercourses and the sea.			Mid Lothian Council
Modelling and assessments to improve knowledge of flood hazards and impacts	100752200 100762200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas - Musselburgh	Ongoing	Revenue budget	East Lothian Council
Flood forecasting and warning	100751800 100761800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Ongoing	Revenue budget	East Lothian Council SEPA
Self Help / Awareness Raising		Self help actions (individuals taking action to protect themselves and their property against flooding e.g. PLP - Property Level Protection) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing	Self - funded	Individuals, businesses, organisations or communities at risk of flooding
Emergency Plans		Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	East Lothian Council Midlothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		impacts where possible.			City of Edinburgh Council Emergency Services
Land Use Planning		Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	East Lothian Council Midlothian Council City of Edinburgh Council
Watercourse Maintenance		Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	East Lothian Council Midlothian Council City of Edinburgh Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Improve Esk	100993291	This action has been identified	Potential actions are drawn	The maintenance of SEPA's flood	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
flood warning scheme	821	because it is technically possible to improve the existing flood warning scheme. It will be selected where the costs of improvement are justified based on the potential benefits.	from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Simplify Esk flood warning scheme	100993291830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Improve signup of Firth of Forth flood warning scheme	100993491822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Simplify Firth of Forth flood warning scheme	100993491830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
			timing of those actions that are identified as being of priority are dependent on funding.	grant funding to enable SEPA to implement new flood warning schemes.	
Sediment Management	100750700 100760700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Wave attenuation	100750800	Wave attenuation actions use the natural characteristics of different types of coastal land cover to either reduce the impact of waves and coastal erosion or to act as a physical barrier to tidal waters.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Property level protection	100751700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths <0.6m in areas of high probability flooding	Awareness raising from SEPA will help property owners determine their required protection levels.		Property owner
Construction of Direct flood Defences	100751400 100761400	**Within Musselburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.**	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.			
Site protection plans	100752100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		Business Owners

Lasswade, Penicuik, Dalkeith and Musselburgh (Potentially Vulnerable Area 10/22)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	Midlothian Council, City of Edinburgh Council, East Lothian Council	River Esk (Lothian)

Background

This Potentially Vulnerable Area covers an area of 97km^2 and is part of the Almond and Edinburgh Group catchment. This is a large, mainly rural area covering southern Musselburgh, Dalkeith, Lasswade, Bonnyrigg and Penicuik (Figure 1). Its main watercourse is the River Esk, forming after the confluence of the River North Esk and River South Esk on the outskirts of Dalkeith. Other notable watercourses include the Park Burn and the Bilston Burn.

The majority of flood damages are caused by surface water flooding (Figure 2). The highest risk of surface water flooding is in Dalkeith, Lasswade and Bonnyrigg. The highest risk of river flooding is from the River Esk, the River South Esk, the River North Esk and the Loan Burn to Musselburgh, Dalkeith and Newbattle, Lasswade and Bonnyrigg and Penicuik. Musselburgh also receives some coastal flooding from the Firth of Forth.

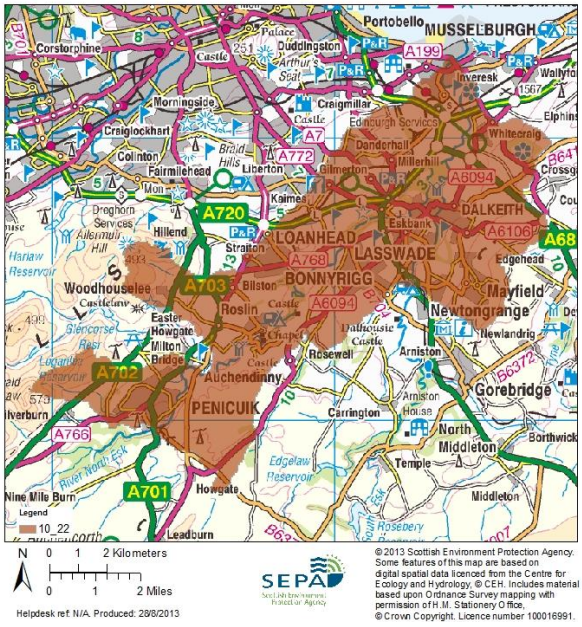


Figure 1: Lasswade, Penicuik, Dalkeith, Musselburgh Potentially Vulnerable Area

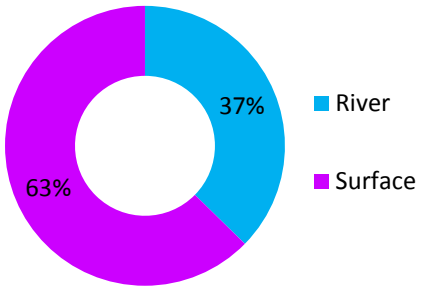


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 300 residential properties and 320 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £1.7 million. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to roads followed by damages to non-residential properties.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	60	300	470
No. of non-residential properties	140	320	370
No. of people	130	660	1,000
Community facilities	<10 Educational buildings	<10 Educational buildings <10 Child day care centres	<10 Educational buildings <10 Child day care centres <10 Emergency services buildings
Utilities	10 Energy sites	20 Energy sites	30 Energy sites <10 Scottish Water assets
Transport links (excluding minor roads)	26 Roads affected at 286 locations • 15 A roads • 11 B roads 1 Railway route affected at 2 locations • Berwick-upon-Tweed to Edinburgh	26 Roads affected at 427 locations • 15 A roads • 11 B roads 1 Railway route affected at 5 locations • Berwick-upon-Tweed to Edinburgh	27 Roads affected at 497 locations • 15 A roads • 12 B roads 1 Railway route affected at 7 locations • Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km^2)	$0.1km^2$ • 4 SSSIs	$0.1km^2$ • 4 SSSIs	$0.1km^2$ • 4 SSSIs
No. of cultural heritage sites	27	29	29
Agricultural land (km^2)	$0.8km^2$	$1.1km^2$	$1.2km^2$

Table 1: Summary of flooding impacts

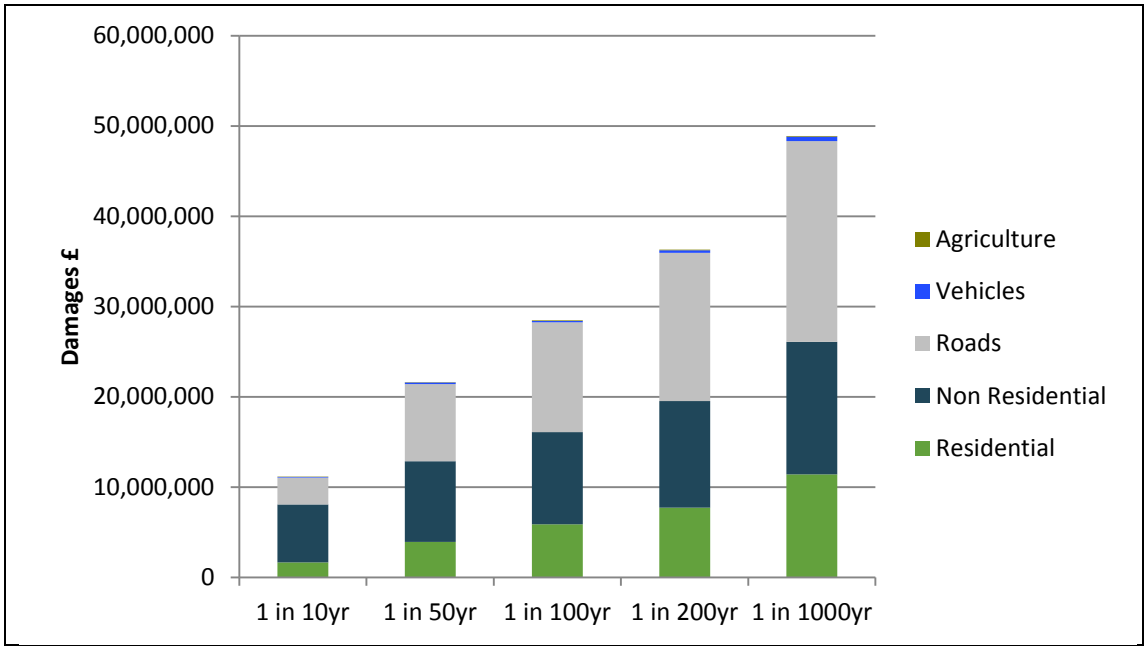


Figure 3: Damages by flood frequency

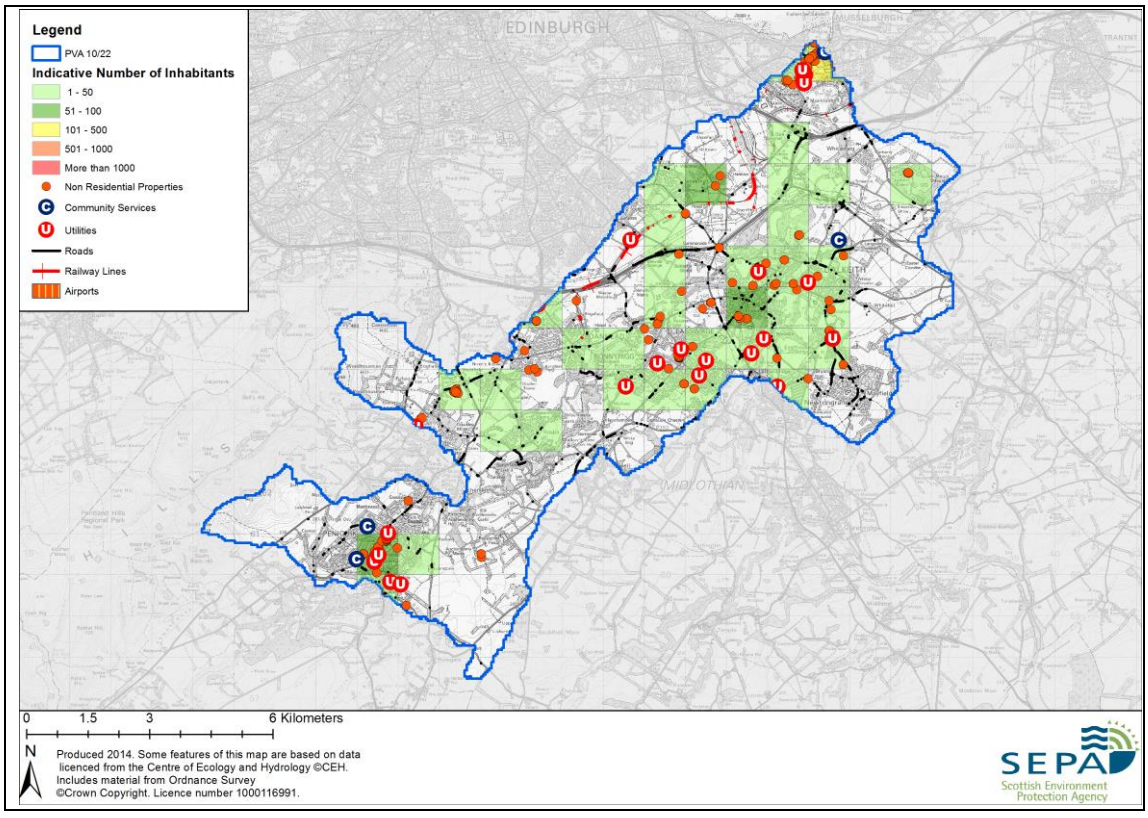


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river floods have been identified as significant in this Potentially Vulnerable Area:

- 6 October 1990: Musselburgh was affected by flooding from the River Esk;
- 13 August 1948: Evacuation required in Musselburgh after flooding occurred in Eskside West, Eskside East, Shorthope Street, Millhill and areas of the High Street.

No significant coastal or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are two formal flood protection schemes to reduce the risk of flooding in this Potentially Vulnerable Area. These are:

- Rullion Road, Penicuik Flood Prevention Scheme 1994: Construction of ditches to divert surface run-off from residential property;
- C53 Polton Road Bridge Relief Culvert Flood Prevention Scheme.

Other actions and natural features may also reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There are two flood warning target areas within this Potentially Vulnerable Area:

- Musselburgh - River flood warning, Esk;
- Musselburgh Coastal - Coastal flood warning, Firth of Forth.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following community groups are known to help with flood resilience within this Potentially Vulnerable Area:

- East Lothian Bio-diversity Group;
- East Lothian Tenants and Residents Panel;
- Musselburgh Waterfront Group;
- Musselburgh and Inveresk Community Council.

Numerous local community councils also operate throughout the East Lothian Council.

The following local incentives or subsidies have also been put in place in order to provide property owners with property level resilience/resistance actions:

- East Lothian Council strategically deploys temporary flood barriers and sand bags when properties are threatened by flooding.

Some local authorities have their own policies regarding property level protection. Contact your local authority or view their website for more information.

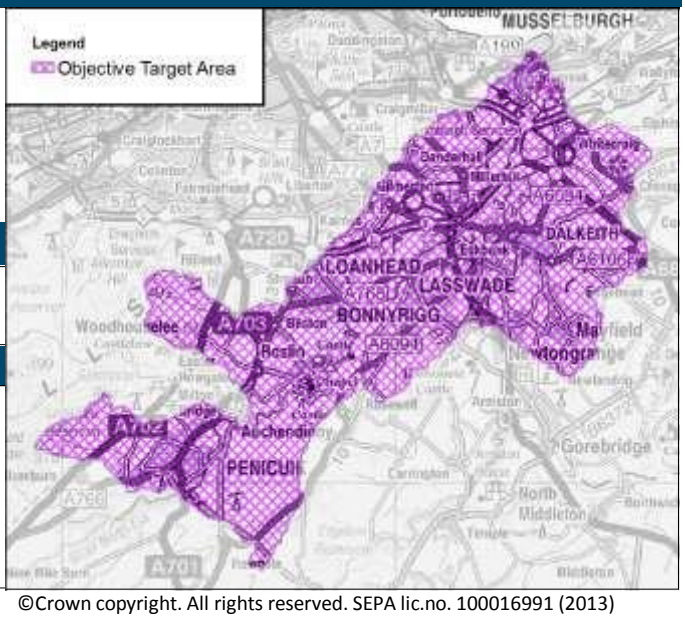
Lasswade, Penicuik, Dalkeith, Musselburgh Potentially Vulnerable Area 10/22 Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Remainder of the Potentially Vulnerable Area	Reduce economic damages to residential and non-residential properties caused by river flooding.	10077
Musselburgh	Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk.	10078
Bilston, Dalkeith and Musselburgh	Reduce risk to people in Bilston, Dalkeith and Musselburgh from river flooding.	10079

Lasswade, Penicuik, Dalkeith, Musselburgh Potentially Vulnerable Area 10/22 Objectives and potential actions

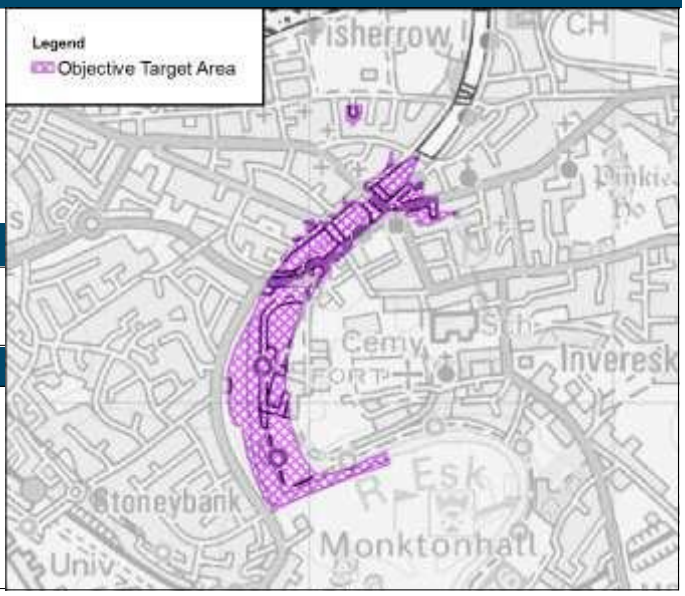
Objective(s):	Remainder of the PVA objective target area
Reduce economic damages to residential and non-residential properties caused by river flooding.	
Objective ID:	
10077	
Indicators:	
£65,000 annual average damages (residential properties) £39,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100770100	Existing defences along the Bilston Burn and an unnamed watercourse provide protection to residential and/or non-residential properties up to a 1 in 100 year flood. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Runoff control	100770500	An area with the potential to be used for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action may not reduce flood risk in the target area. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
Sediment management	100770700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of direct flood defences	100771400	The potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100771700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*

Lasswade, Penicuik, Dalkeith, Musselburgh Potentially Vulnerable Area 10/22 Objectives and potential actions

Site protection plans	100772100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100772200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Lasswade, Penicuik, Dalkeith, Musselburgh Potentially Vulnerable Area 10/22 Objectives and potential actions

Objective(s):	Musselburgh objective target area
Reduce economic damages to residential and non-residential properties in Musselburgh caused by flooding from the River Esk.	

Objective ID:

10078

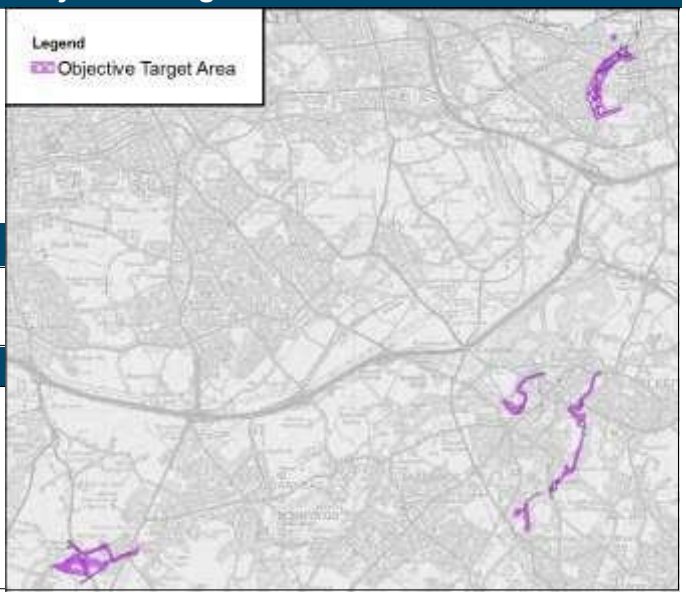
Indicators:

£100,000 annual average damages (residential properties)

£390,000 annual average damages (non-residential properties)

Potential action	Action ID	Description
Sediment management	100780700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of direct flood defences	100781400	Within Musselburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100781700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100782100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100782200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Lasswade, Penicuik, Dalkeith, Musselburgh Potentially Vulnerable Area 10/22 Objectives and potential actions

Objective(s):	Bilston, Dalkeith and Musselburgh objective target area
Reduce risk to people in Bilston, Dalkeith and Musselburgh from river flooding.	
Objective ID:	
10079	
Indicators:	
370 people at risk (from a medium likelihood flood)	

Potential action	Action ID	Description
Sediment management	100790700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of direct flood defences	100791400	Within Bilston, Dalkeith and Musselburgh, the potential to construct direct defences has been identified to reduce the risk to residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100791700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Improved understanding	100792200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Lasswade, Penicuik, Dalkeith, Musselburgh (South) (Potentially Vulnerable Area 10/22)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintain Esk flood warning scheme	100993291810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Surface water management plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Proportional funding of the study by appropriate Council's Revenue Budget	City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Edinburgh & Lothians Integrated catchment study	10052239	An integrated catchment study is being carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Ongoing. Results of study will be apparent by 2017.	Proportional funding of the study by appropriate Council's Revenue Budget and Scottish Water	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Flood forecasting and warning	100781800 100791800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary	Ongoing	Revenue budget	East Lothian Council SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		barriers to reduce flooding impacts.			
Modelling and assessments to improve knowledge of flood hazards and impacts	100772200 100782200 100792200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas - Musselburgh	Ongoing	Revenue budget	East Lothian Council
Maintenance of existing flood protection schemes	100770100	**Existing defences along the Bilston Burn and an unnamed watercourse provide protection to residential and/or non-residential properties up to a 1 in 100 year event.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing.	Midlothian Council annual revenue budget.	Midlothian Council
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding e.g. PLP - Property Level Protection) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing	Self - funded	Property-owners SEPA
Emergency Plans	-	Emergency response plans are applicable for all flood sources and	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	East Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.			Midlothian Council City of Edinburgh Council Emergency Services
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	East Lothian Council Midlothian Council City of Edinburgh Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	East Lothian Council Midlothian Council City of Edinburgh Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Improve Esk flood warning scheme	100993291821	This action has been identified because it is technically possible to improve the existing flood warning scheme. It will be selected where the costs of improvement are justified based on the potential benefits.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Simplify Esk flood warning scheme	100993291830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Runoff Control	100770500	An area with the potential to be used for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action will not reduce flood risk in the target area.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Sediment Management	100770700 100780700 100790700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability. Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding settlement from the Scottish Government.		East Lothian Council Midlothian Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Construction of Direct flood Defences	100771400 100781400 100791400	The potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council Midlothian Council
Property level protection	100771700 100781700 100791700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths<0.6m in areas of high probability flooding.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability. Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding settlement from the Scottish Government.		Property Owners Property owners, Midlothian Council
Site protection plans	100772100 100782100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability. Raising awareness of vulnerable sites through provision of council and SEPA data will help business owners determine their required protection levels.		Business Owners
Modelling and other assessments to improve knowledge of flood hazards and impacts	100772200 100792200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding settlement from the Scottish Government.		Midlothian Council

Cockenzie and Port Seton, Longniddry, Prestonpans (Potentially Vulnerable Area 10/23)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	East Lothian Council	East Lothian Coastal

Background

This Potentially Vulnerable Area covers an area of 65km^2 and is part of the East Lothian and Berwickshire Group catchment. This is a moderately sized coastal area in the west of the catchment covering Cockenzie and Port Seton, Tranent, Prestonpans and Longniddry (Figure 1).

Its main watercourses are the Redhouse Burn and the Seton Dean. The flood risk in this area comes from river and surface water. The highest risk of surface water flooding is in Tranent. The majority of flood damages are caused by surface water flooding (Figure 2).

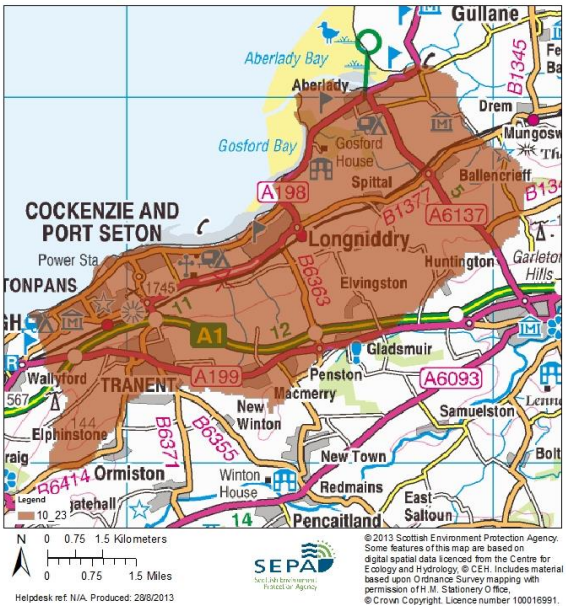


Figure 1: Potentially Vulnerable Area 10/23

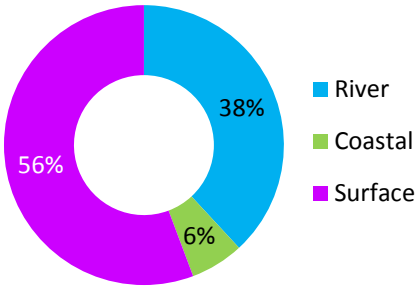


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 120 residential properties and 60 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1 and a map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £700,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to roads followed by damages to residential properties.

In 2010 Scottish Water carried out a Flood Risk Assessment Study of water and wastewater assets across Scotland. Of the assets assessed, one wastewater asset was identified as being at risk of flooding within this Potentially Vulnerable Area.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	50	120	180
No. of non-residential properties	30	60	70
No. of people	110	260	400
Community facilities	0	0	0
Utilities	<10 Energy sites	10 Energy sites <10 Scottish Water assets	10 Energy sites <10 Scottish Water assets
Transport links (excluding minor roads)	11 Roads affected at 103 locations • 4 A Roads • 7 B Roads 1 Railway route affected at 23 locations • Berwick-upon-Tweed to Edinburgh	11 Roads affected at 158 locations • 4 A Roads • 7 B Roads 1 Railway route affected at 28 locations • Berwick-upon-Tweed to Edinburgh	11 Roads affected at 174 locations • 4 A Roads • 7 B Roads 1 Railway route affected at 29 locations • Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km^2)	0.5km² • 1 SSSI • 1 SPA • 1 SAC	0.5km² • 1 SSSI • 1 SPA • 1 SAC	0.6km² • 1 SSSI • 1 SPA • 1 SAC
No. of cultural heritage sites	15	19	19
Agricultural land (km^2)	1.4km²	1.9km²	2.1km²

Table 1: Summary of flooding impacts

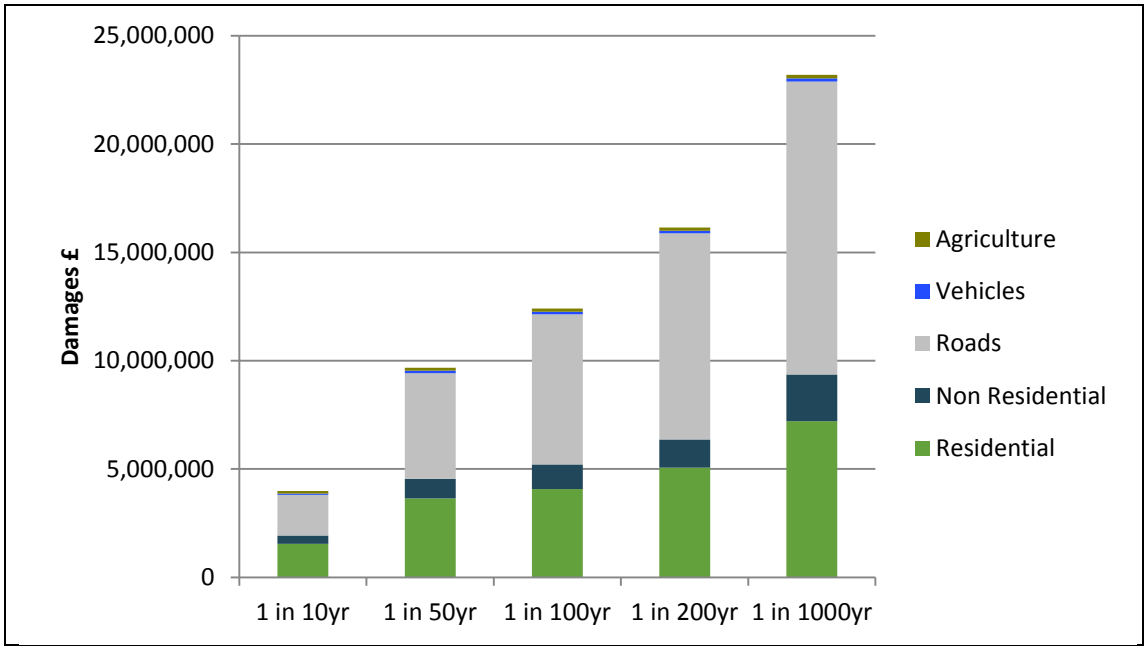


Figure 3: Damages by flood frequency

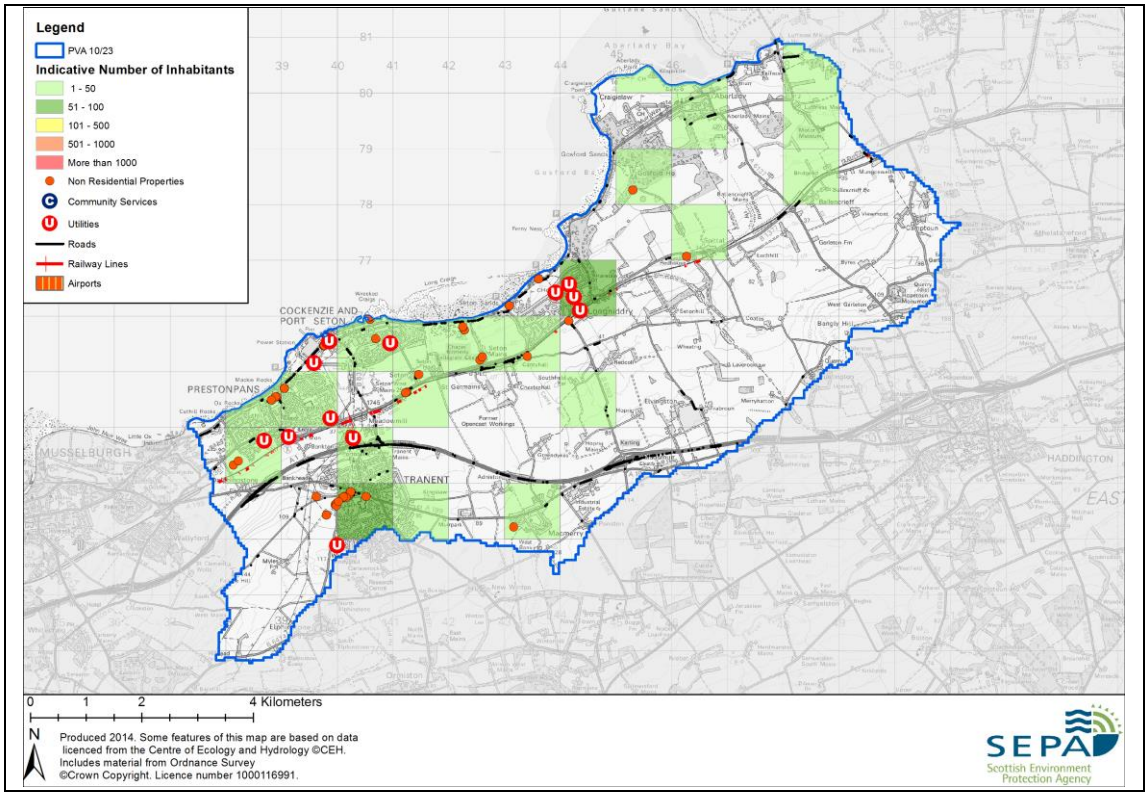


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following coastal flood has been identified as significant in this Potentially Vulnerable Area:

- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive flooding along the East Coast of Scotland, with the Firth of Forth being one of the worst affected areas. Locations within this coastal area affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads with Edinburgh City Council estimating the costs to repair damages in the region of £650,000.

No significant river or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There is one formal flood protection scheme in this Potentially Vulnerable Area; this is the Prestonpans Flood Protection Scheme. Other actions and natural features may also reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There is one flood warning target area within this Potentially Vulnerable Area:

- Prestonpans, Cockenzie and Port Seton - Coastal flood warning, Firth of Forth and Tay

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following community groups are known to help with flood resilience within this catchment:

- East Lothian Bio-diversity Group;
- East Lothian Tenants and Residents Panel;
- Coastal Regeneration Group for Port Seton and Cockenzie.

Numerous local community councils also operate throughout the East Lothian Council.

The following local incentives or subsidies have also been put in place in order to provide property owners with property level resilience/resistance actions:

- East Lothian Council strategically deploys temporary flood barriers and sand bags when properties are threatened by flooding.

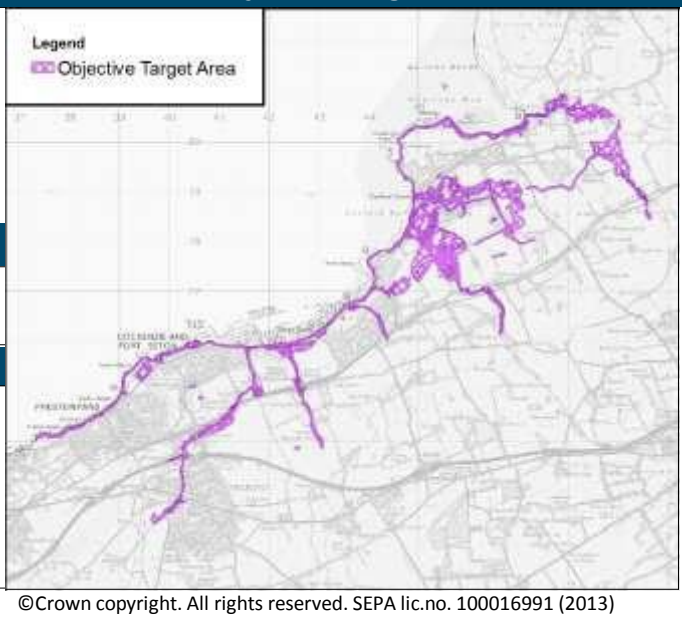
Cockenzie, Port Seton, Longniddry, Prestonpans Potentially Vulnerable Area 10/23 Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions.*	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Cockenzie, Port Seton, Longniddry and Prestonpans	Reduce economic damages to residential and non-residential properties caused by river and coastal flooding.	10080
Tranent	Reduce risk to people in Tranent from river flooding.	10081

Cockenzie, Port Seton, Longniddry, Prestonpans Potentially Vulnerable Area 10/23 Objectives and potential actions

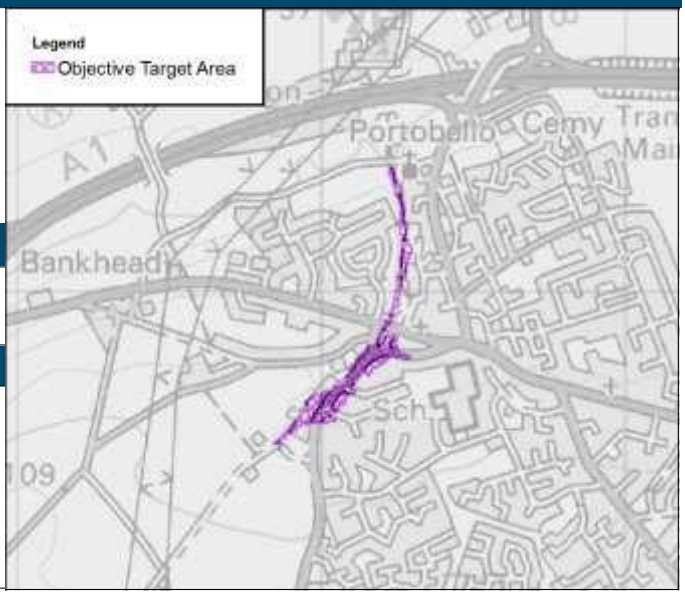
Objective(s):	Cockenzie, Port Seton, Longniddry and Prestonpans objective target area
Reduce economic damages to residential and non-residential properties caused by river and coastal flooding.	
Objective ID:	
10080	
Indicators:	
£230,000 annual average damages (residential properties) £40,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100800100	Existing defences along the coast provide protection to residential and/or non-residential properties. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Sediment management	100800700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Wave attenuation	100800800	*Wave attenuation uses the natural characteristics of coastal land cover either to reduce the impact of waves and coastal erosion, or to act as a physical barrier to tidal waters.*
Modification of conveyance	100801100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Installation / modification of river control structures	100801200	*Control structures on a river can reduce flood levels either by restricting or increasing flow in the channel. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.*
Construction of direct flood defences	100801400	Within Cockenzie, Port Seton, Longniddry and Prestonpans the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*

Cockenzie, Port Seton, Longniddry, Prestonpans Potentially Vulnerable Area 10/23 Objectives and potential actions

Property level protection	100801700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100802100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100802200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Cockenzie, Port Seton, Longniddry, Prestonpans Potentially Vulnerable Area 10/23 Objectives and potential actions

Objective(s):	Tranent objective target area
Reduce risk to people in Tranent from river flooding.	

Objective ID:

10081

Indicators:

90 people at risk (from a medium likelihood flood)

Potential action	Action ID	Description
Sediment management	100810700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100811100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Installation / modification of river control structures	100811200	*Control structures on a river can reduce flood levels either by restricting or increasing flow in the channel. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.*
Construction of direct flood defences	100811400	*Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Improved understanding	100812200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Cockenzie & Port Seton, Longniddry, Prestonpans (Potentially Vulnerable Area 10/23)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintain Firth of Forth flood warning scheme	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing.		SEPA
Surface water management plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Revenue Budget	City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Edinburgh & Lothians Integrated catchment study	10052239	An integrated catchment study is being carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Ongoing. Results of study will be apparent by 2017.	Revenue Budget	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Maintenance of existing flood protection schemes	100800100	Existing defences along the coast provide protection to residential and/or non-residential properties.	Ongoing	Revenue budget	East Lothian Council
Flood forecasting and warning	100801800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the	Ongoing	Revenue budget	East Lothian Council SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		floodplain and by placing temporary barriers to reduce flooding impacts.			
Self Help / Awareness Raising	100801900 100811900	Self help actions (individuals taking action to protect themselves and their property against flooding e.g. PLP - Property Level Protection) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing	Self - funded	Property-owners SEPA
Emergency Plans	100802000 100812000	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing	Revenue budget	East Lothian Council Emergency Services
Land Use Planning	100800300 100800400 100810300 100810400	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Revenue budget	East Lothian Council
Watercourse Maintenance	100801600 100811600	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing	Revenue budget	East Lothian Council Landowners

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Improve signup of Firth of Forth flood warning scheme	100993491822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Simplify Firth of Forth flood warning scheme	100993491830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Sediment Management	100800700 100810700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Wave attenuation	100800800	Wave attenuation actions use the natural characteristics of different types of coastal land cover to either reduce the impact of waves and coastal erosion or to act as a	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		physical barrier to tidal waters.			
Modification of Conveyance	100801100 100811100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Installation / modification of fluvial control structures	100801200 100811200	Fluvial control structures can reduce flood levels to a target area by either restricting or increasing channel flow. The impact of these structures can vary significantly depending on type and location of the structures being added or modified	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Construction of Direct flood Defences	100801400 100811400	Within Cockenzie, Port Seton, Longniddry, Prestonpans and Tranent the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Property level protection	100801700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		Property Owners
Site protection plans	100802100 100812100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		Business Owners

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		protection or resilience of the facility or the network.			
Modelling and assessments to improve knowledge of flood hazards and impacts	100802200 100812200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council

Haddington (Potentially Vulnerable Area 10/24)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	East Lothian Council	River Tyne

Background

This Potentially Vulnerable Area covers an area of 16km^2 and is part of the East Lothian and Berwickshire Group catchment. This is a small, rural area covering Haddington and its immediate surrounding areas to the north, south and east (Figure 1). Its main watercourse is the River Tyne which flows through the south of Haddington before flowing through the town centre and out to the east.

The majority of damages are caused by river flooding (Figure 2). The highest risk of river flooding is from the River Tyne to Haddington and the highest risk of surface water flooding is also in Haddington.

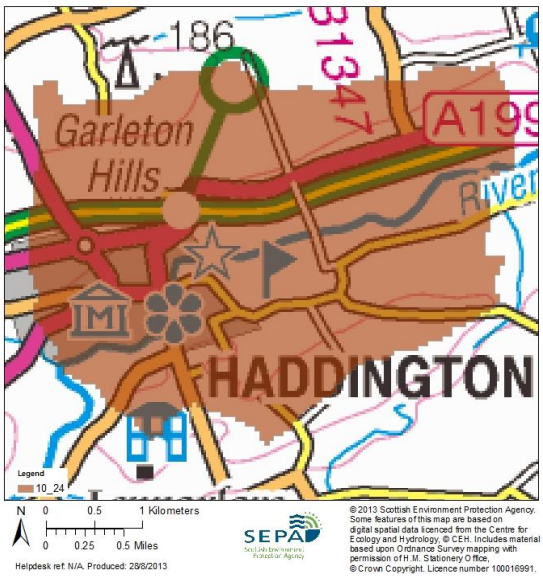


Figure 1: Haddington Potentially Vulnerable Area

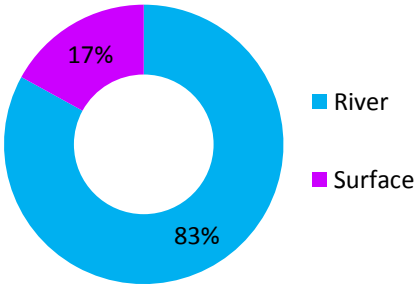


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 230 residential properties and 180 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £700,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to non-residential properties.

	High likelihood	Medium likelihood	Low likelihood
No. of residential Properties	70	230	330
No. of non-residential properties	30	180	210
No. of people	150	510	730
Community facilities	0	<10 Educational buildings	<10 Educational buildings
Utilities	<10 Energy sites	<10 Energy sites <10 Communications sites	<10 Energy sites <10 Communications sites
Transport links (excluding minor roads)	5 Roads affected at 25 locations • 4 A roads • 1 B roads	7 Roads affected at 59 locations • 5 A roads • 2 B roads	7 Roads affected at 68 locations • 5 A roads • 2 B roads
Environmental designated areas (km^2)	0	0	0
No. of cultural heritage sites	5	5	5
Agricultural land (km^2)	$0.6km^2$	$0.8km^2$	$0.9km^2$

Table 1: Summary of flooding impacts

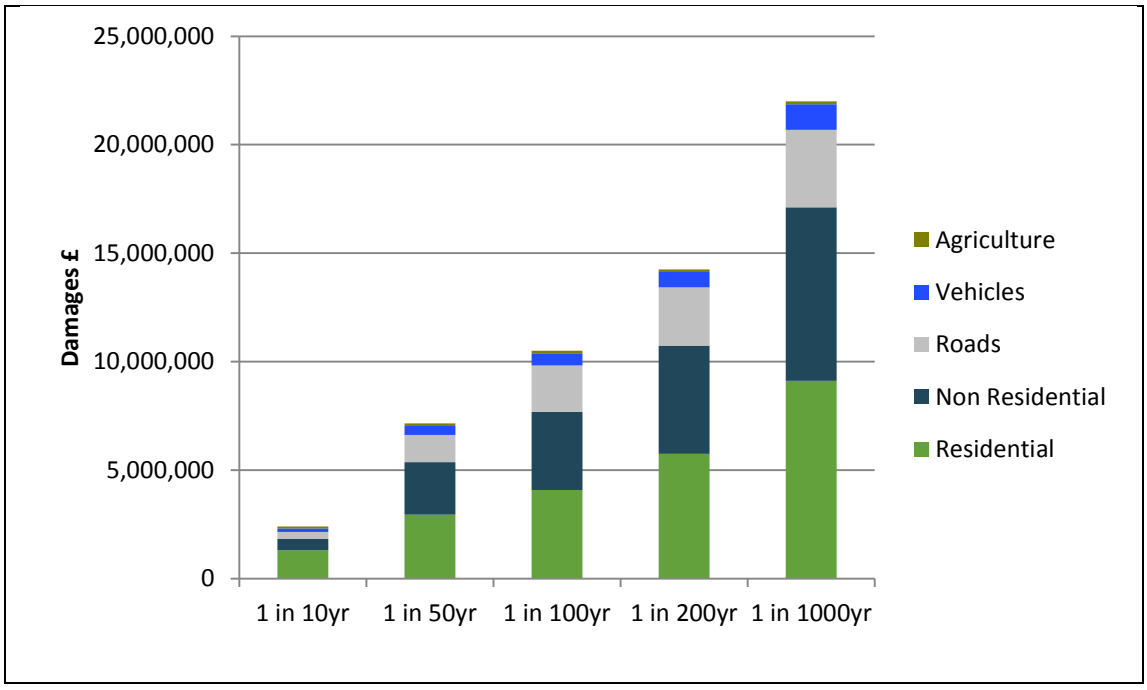


Figure 3: Damages by flood frequency

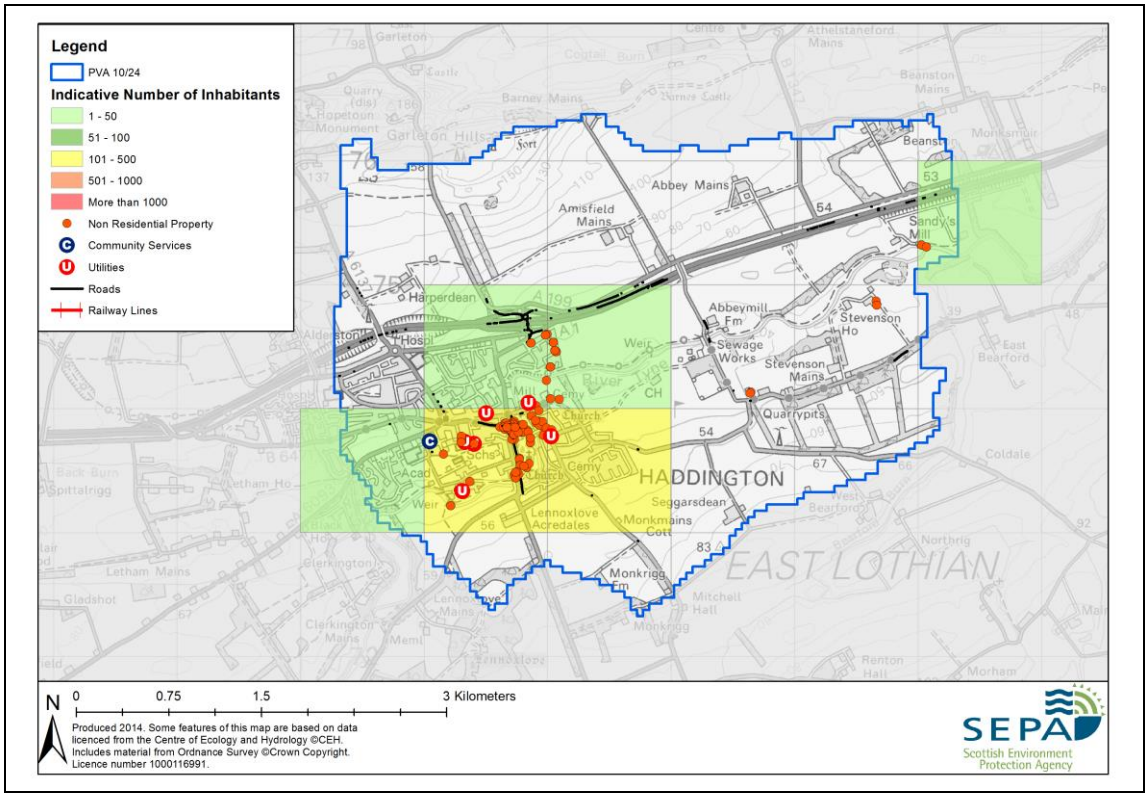


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river floods have been identified as significant in this Potentially Vulnerable Area.

- 7 July and 25 Sept 2012: Property flooding in Haddington due to drains and watercourses backing up and unable to discharge into the River Tyne due to high river levels. Wider property flooded avoided by actions taken by East Lothian Council;
- 12 August 1948: The waters of the River Tyne rose 2 inches above the levels reached during the large flood of 1775. High Street flooded to a depth of 57 inches. The flood event is known to have affected a large area with railway lines and road bridges damaged or destroyed and multiple buildings flooded;
- 1926 and 1932: Photographic evidence of large flood events in Haddington;
- October 1775: Large flood event in Haddington inundating most of the town.

No significant surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There are three flood warning target areas within this Potentially Vulnerable Area:

- Haddington (Red) - River flood warning, Tyne;
- Haddington (Orange) - River flood warning, Tyne;
- Haddington (Green) - River flood warning, Tyne.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following community groups are known to help with flood resilience within this Potentially Vulnerable Area:

- East Lothian Bio-diversity Group;
- East Lothian Tenants and Residents Panel;
- Friends of the River Tyne.

Numerous local community councils also operate throughout East Lothian Council.

The following local incentives or subsidies have also been put in place in order to provide property owners with property level resilience/resistance actions:

- East Lothian Council strategically deploys temporary flood barriers and sand bags when properties are threatened by flooding.

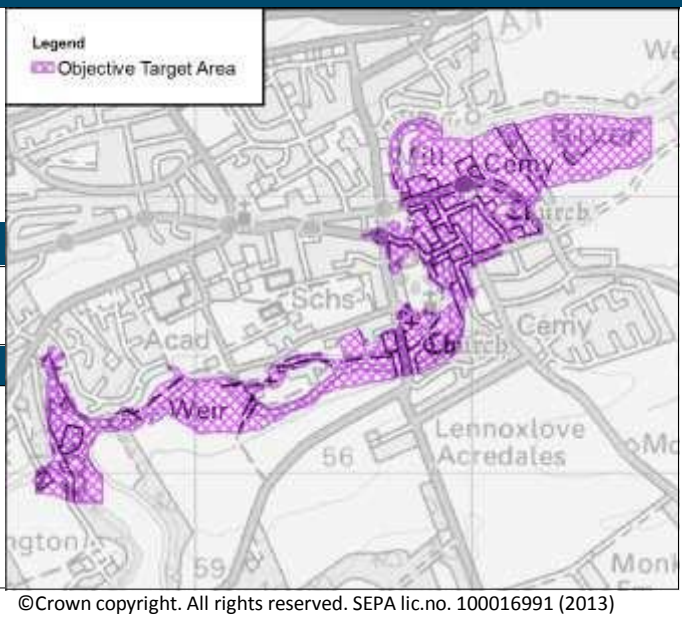
Haddington
Potentially Vulnerable Area 10/24
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local District Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Haddington	Reduce economic damages to residential and non-residential properties in Haddington caused by flooding from the River Tyne.	10082

Haddington
Potentially Vulnerable Area 10/24
Objectives and potential actions

Objective(s):	Haddington objective target area
Reduce economic damages to residential and non-residential properties in Haddington caused by flooding from the River Tyne.	
Objective ID:	
10082	
Indicators:	
£370,000 annual average damages (residential properties) £180,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Runoff control	100820500	Upstream of Haddington an area with the potential to be used for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action may not reduce flood risk in the target area. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
River or floodplain restoration	100820600	Upstream of Haddington land with the potential to be used for river or floodplain restoration has been identified. This could offer some reduction in flood risk along the River Tyne, Tyne Water and other watercourses for a high likelihood flood. *Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.*
Sediment management	100820700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100821100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Installation / modification of river control structures	100821200	*Control structures on a river can reduce flood levels either by restricting or increasing flow in the channel. The impact of these structures can vary significantly depending on type and location of the structures being added or modified.*
Construction of direct flood defences	100821400	Within Haddington, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*

Haddington
Potentially Vulnerable Area 10/24
Objectives and potential actions

Property level protection	100821700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100822100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100822200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Haddington (Potentially Vulnerable Area 10/24)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintain Tyne flood warning scheme	100993451810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Surface water management plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Revenue Budget	City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Flood forecasting and warning	100821800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Ongoing	Revenue budget	East Lothian Council SEPA
Modelling and assessments to improve knowledge of flood hazards	100822200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas - Haddington	Ongoing	Revenue budget	East Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
and impacts					
Self Help / Awareness Raising	100821900	Self help actions (individuals taking action to protect themselves and their property against flooding e.g. PLP - Property Level Protection) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing	Self - funded	Property-owners SEPA
Emergency Plans	100822000	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing	Revenue budget	East Lothian Council Emergency Services
Land Use Planning	100820300 100820400	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Revenue budget	East Lothian Council
Watercourse Maintenance	100821600	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing	Revenue budget	East Lothian Council Landowners

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Improve signup of Tyne flood warning scheme	100993451822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Simplify Tyne flood warning scheme	100993451830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Haddington Integrated catchment study	10052239	An integrated catchment study is to be carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network and watercourses.	Programmed by Scottish Water		Scottish Water led in partnership with East Lothian Council,

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Runoff Control	100820500	Upstream of Haddington an area with the potential to be used for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action will not reduce flood risk in the target area.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
River or floodplain restoration	100820600	Upstream of Haddington land with the potential to be used for river or floodplain restoration has been identified. This could offer a limited reduction in flood risk along the River Tyne, Tyne Water and other watercourses for a high likelihood event.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Sediment Management	100820700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Modification of Conveyance	100821100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Installation / modification of fluvial control structures	100821200	Fluvial control structures can reduce flood levels to a target area by either restricting or increasing channel flow. The impact of these structures can vary significantly depending on type and location of the structures being added or modified	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Construction of Direct flood Defences	100821400	Within Haddington, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Property level protection	100821700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		Property Owners
Site protection plans	100822100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		Business Owners

Dunbar, West Barns (Potentially Vulnerable Area 10/25)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	East Lothian Council	East Lothian Coastal

Background

This Potentially Vulnerable Area covers an area of 19km^2 and is part of the East Lothian and Berwickshire Group catchment. This is a small, coastal area in the east of the catchment covering Dunbar and West Barns and its immediate surrounding rural areas (Figure 1). The main watercourse is the Biel Water which flows through the west of the Potentially Vulnerable Area towards the north east, passing around the West Barns and discharging into the North Sea at Belhaven Bay.

The highest risk of river flooding is from the Biel Water and the Hedderwick Burn to Dunbar and West Barns. The highest risk of coastal flooding is from the North Sea to Dunbar and West Barns. The flood damages are caused by river, coastal and surface water sources (Figure 2).

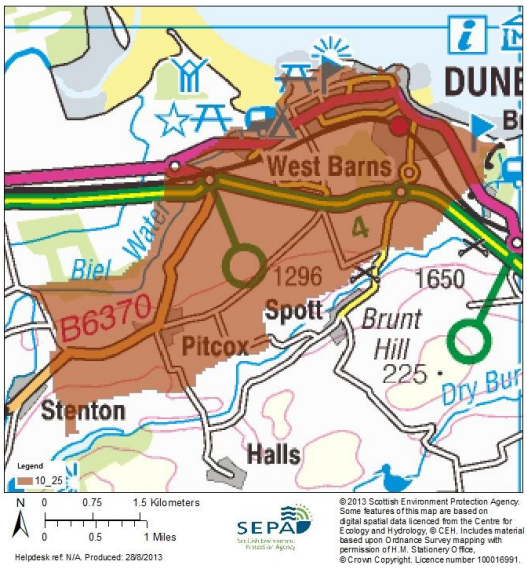


Figure 1: Dunbar, West Barns Potentially Vulnerable Area

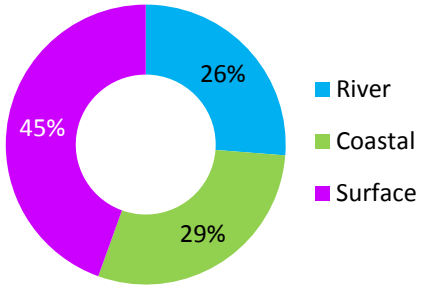


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 40 residential properties and 20 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1 and a map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £200,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to roads followed by damages to residential properties.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	10	40	60
No. of non-residential properties	10	20	20
No. of people	20	90	130
Community facilities	0	0	0
Utilities	<10 Energy sites	<10 Energy sites	<10 Energy sites
Transport links (excluding minor roads)	4 Roads affected at 39 locations • 3 A roads • 1 B road 1 Railway route affected at 15 locations • Berwick-upon-Tweed to Edinburgh	4 Roads affected at 49 locations • 3 A roads • 1 B road 1 Railway route affected at 17 locations • Berwick-upon-Tweed to Edinburgh	4 Roads affected at 57 locations • 3 A roads • 1 B road 1 Railway route affected at 18 locations • Berwick-upon-Tweed to Edinburgh
Environmental designated areas (km^2)	0.2km^2 • 1 SSSI • 1 SPA • 1 SAC	0.2km^2 • 1 SSSI • 1 SPA • 1 SAC	0.2km^2 • 1 SSSI • 1 SPA • 1 SAC
No. of cultural heritage sites	9	9	9
Agricultural land (km^2)	0.3km^2	0.4km^2	0.5km^2

Table 1: Summary of flooding impacts

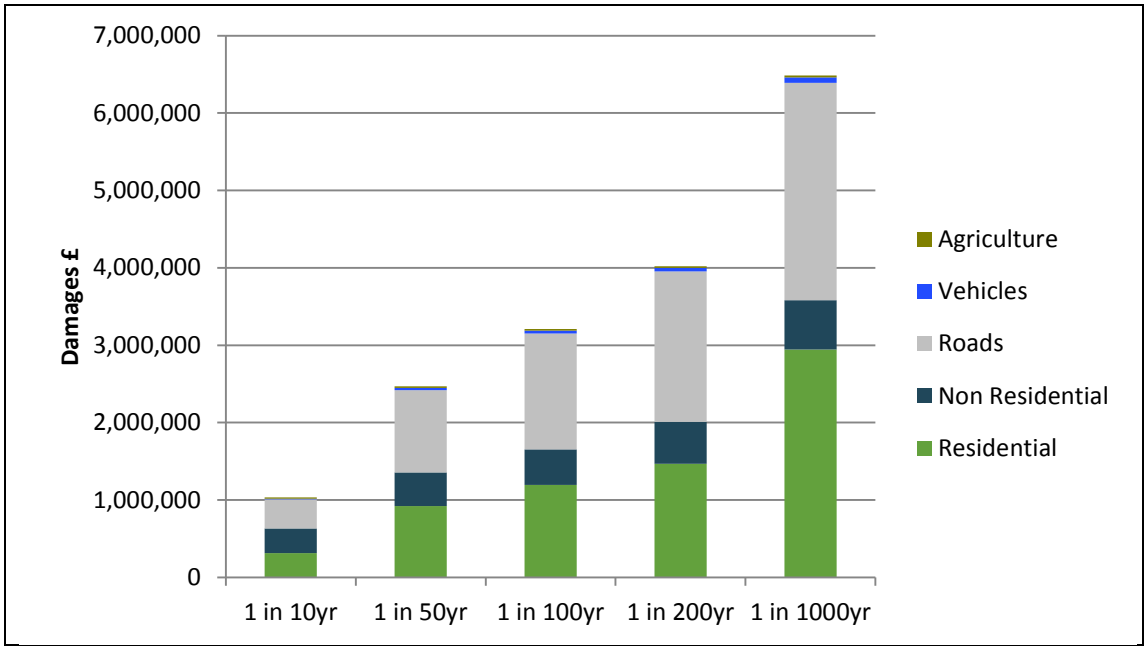


Figure 3: Damages by flood frequency

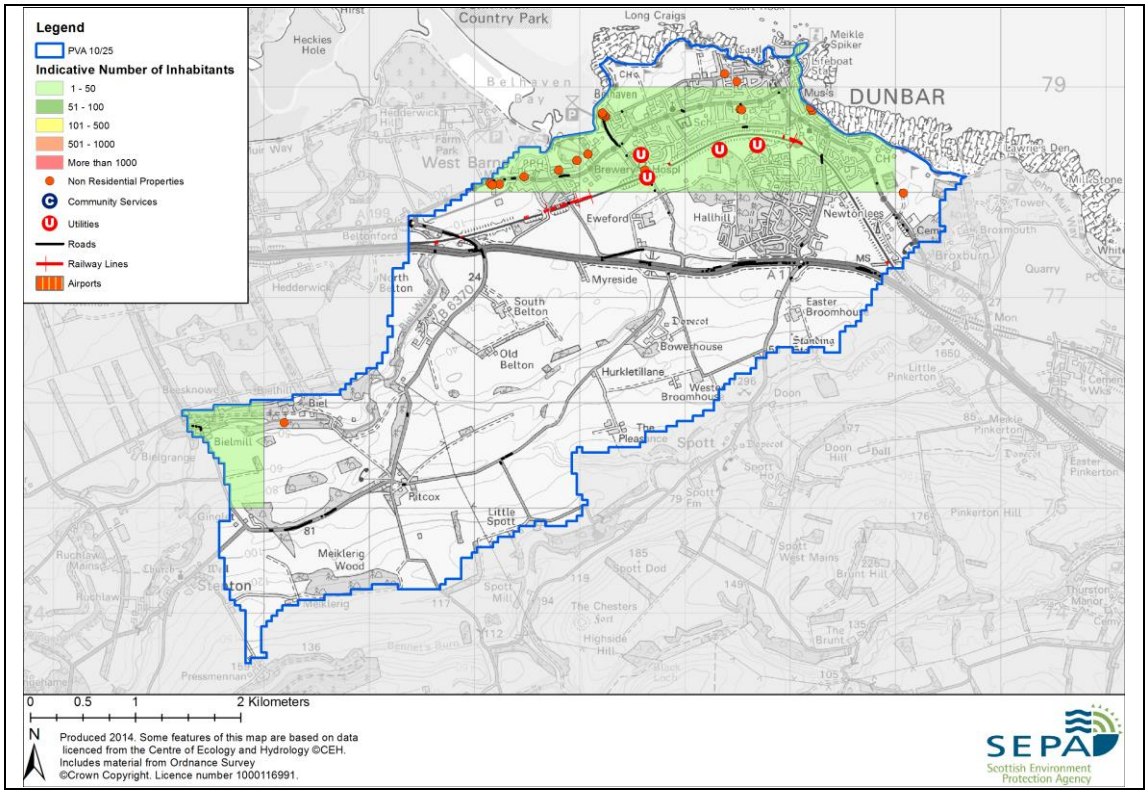


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river flood has been identified as significant in this Potentially Vulnerable Area:

- 22 October 2002: Belhaven hospital flooded. Patients had to be evacuated after the generator room was shut down and ward closed.

The following coastal floods have been identified as significant in this Potentially Vulnerable Area:

- 5 December 2012: A combination of wind and high tides caused large waves and coastal flooding along the east coast of Scotland. There was significant damage to North Berwick harbour and damage to the communal slipway at Dunbar harbour
- 30 March 2010: A tidal surge coinciding with the highest mean tides of the year caused extensive flooding along the east coast of Scotland. Locations within this coastal area affected included Leith, Musselburgh, Prestonpans, Port Seton, Dunbar and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads
- August 1949: Storm surge flooding to Dunbar.

No significant surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There is one flood warning target area within this Potentially Vulnerable Area:

- Dunbar including West Barns - Coastal flood warning, Firth of Forth.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following community groups are known to help with flood resilience within this catchment:

- East Lothian Bio-diversity Group;
- East Lothian Tenants and Residents Panel;
- Dunbar Shore and Harbour Neighbourhood Group.

Numerous local community councils also operate throughout East Lothian Council.

The following local incentives or subsidies have also been put in place in order to provide property owners with property level resilience/resistance actions:

- East Lothian Council strategically deploys temporary flood barriers and sand bags when properties are threatened by flooding.

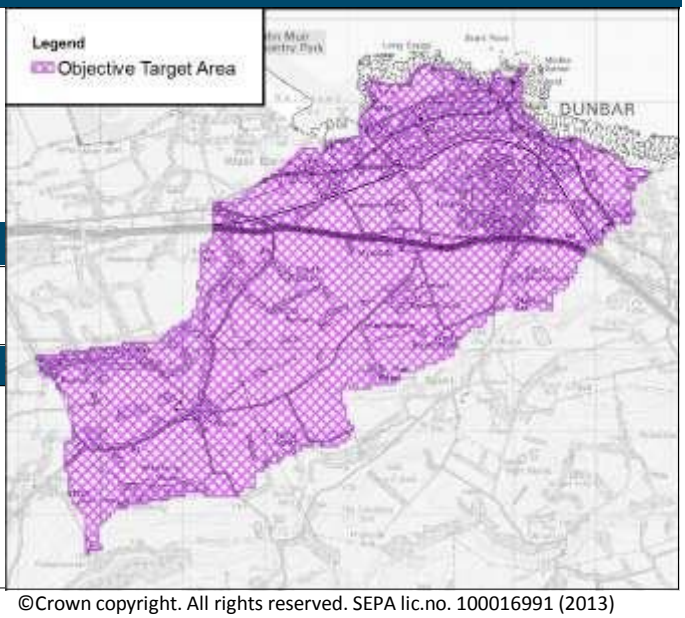
Dunbar, West Barns
Potentially Vulnerable Area 10/25
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Dunbar and West Barns	Reduce economic damages to residential and non-residential properties caused by river and coastal flooding.	10083

Dunbar, West Barns
Potentially Vulnerable Area 10/25
Objectives and potential actions

Objective(s):	Dunbar and West Barns objective target area
Reduce economic damages to residential and non-residential properties caused by river and coastal flooding.	
Objective ID:	
10083	
Indicators:	
£70,000 annual average damages (residential properties) £32,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Runoff control	100830500	Upstream of Dunbar and West Barns an area with the potential for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action may not reduce flood risk in the target area. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
River or floodplain restoration	100830600	Upstream of Dunbar and West Barns land with potential for river/ floodplain restoration has been identified. Further analysis has shown that its position within the catchment and / or its size, this action may not reduce flood risk in the target area. *Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.*
Sediment management	100830700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Wave attenuation	100830800	*Wave attenuation uses the natural characteristics of coastal land cover either to reduce the impact of waves and coastal erosion, or to act as a physical barrier to tidal waters.*
Modification of conveyance	100831100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Construction of direct flood defences	100831400	Within Dunbar and West Barns, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*

Dunbar, West Barns
Potentially Vulnerable Area 10/25
Objectives and potential actions

Property level protection	100831700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100832100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100832200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Dunbar, West Barns (Potentially Vulnerable Area 10/25)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Maintain Firth of Forth flood warning scheme	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing.		SEPA
Surface water management plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Revenue Budget	City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Flood forecasting and warning	100831800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Ongoing	Revenue budget	East Lothian Council SEPA
Self Help / Awareness Raising	100831900	Self help actions (individuals taking action to protect themselves and their property against flooding e.g. PLP - Property Level Protection) can be undertaken by any individuals, businesses, organisations or	Ongoing	Self - funded	Property-owners SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.			
Emergency Plans	100832000	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing	Revenue budget	East Lothian Council Emergency Services
Land Use Planning	100830300 100830400	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Revenue budget	East Lothian Council
Watercourse Maintenance	100831600	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing	Revenue budget	East Lothian Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Improve signup	100993491	This action has been identified	Potential actions are drawn	The maintenance of SEPA's flood	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
of Firth of Forth flood warning scheme	822	because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%. If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Simplify Firth of Forth flood warning scheme	100993491830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Dunbar Integrated catchment study	10052239	An integrated catchment study is to be carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network and watercourses.	Programmed by Scottish Water		Scottish Water led in partnership with East Lothian Council,
Runoff Control	100830500	Upstream of Dunbar and West Barns an area with the potential for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		/ or its size, this action will not reduce flood risk in the target area.			
River or floodplain restoration	100830600	**Upstream of Dunbar and West Barns land with potential for river/ floodplain restoration has been identified.** Further analysis has shown that its position within the catchment and / or its size, this action will not reduce flood risk in the target area.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Sediment Management	100830700	Sediment management can help control the sediment balance in the catchment,maintain channel capacity and reduce the impact of siltation at structures and other key areas.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Wave attenuation	100830800	Wave attenuation actions use the natural characteristics of different types of coastal land cover to either reduce the impact of waves and coastal erosion or to act as a physical barrier to tidal waters.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Modification of Conveyance	100831100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council
Construction of Direct flood Defences	100831400	Within Haddington, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		properties from a medium likelihood flood event.			
Property level protection	100831700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		Property Owners
Site protection plans	100832100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		Business Owners
Modelling and assessments to improve knowledge of flood hazards and impacts	100832200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	If the potential action is found by SEPA and their contractors to be technically viable this will be considered subject to future funding availability.		East Lothian Council

Berwickshire Coast (Potentially Vulnerable Area 10/26)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	Scottish Borders Council	Berwickshire Group

Background

This Potentially Vulnerable Area covers an area of 40km^2 and is part of the East Lothian and Berwickshire Group catchment. This is a small, coastal area covering part of Eyemouth, St Abb's Head and Coldingham (Figure 1). The main watercourses are the Eye Water, the Milldown Burn and the Dowlaw Burn. There are also a number of unnamed burns which further contribute to flooding. Coastal and river flood interaction occurs on the Eye Water with coastal flooding extending upstream for approximately 1.5km.

The majority of flood damages are caused by coastal flooding (Figure 2). The highest risk of coastal flooding is from the North Sea to Eyemouth. The highest risk of river flooding is from the Eye Water to Eyemouth.

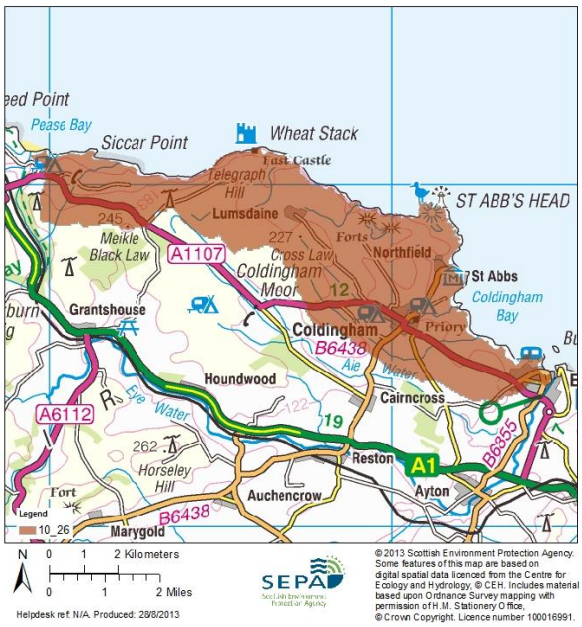


Figure 1: Berwickshire coast Potentially Vulnerable Area

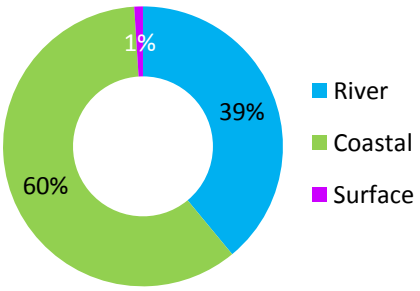


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 70 residential properties and 50 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts of flooding from all sources during a medium likelihood event can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £260,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	60	70	80
No. of non-residential properties	20	50	50
No. of people	130	150	180
Community facilities	0	0	0
Utilities	<10 Energy sites	<10 Energy sites	<10 Energy sites
Transport links (excluding minor roads)	2 roads affected at 3 locations • 1 A road • 1 B road	2 roads affected at 4 locations • 1 A road • 1 B road	2 roads affected at 3 locations • 1 A road • 1 B road
Environmental designated areas (km^2)	0.8km^2 • 3 SSSI • 2 SPA • 3 SAC	0.8km^2 • 3 SSSI • 2 SPA • 3 SAC	0.8km^2 • 3 SSSI • 2 SPA • 3 SAC
No. of cultural heritage sites	5	5	5
Agricultural land (km^2)	0.1km^2	0.1km^2	0.1km^2

Table 1: Summary of flooding impacts

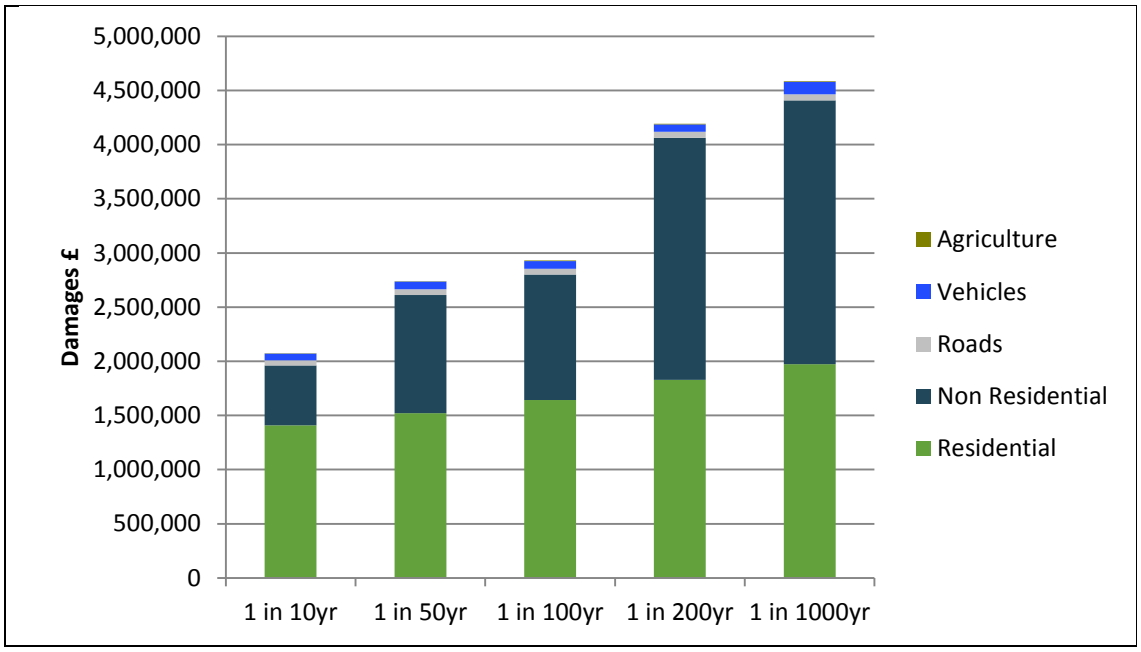


Figure 3: Damages by flood frequency

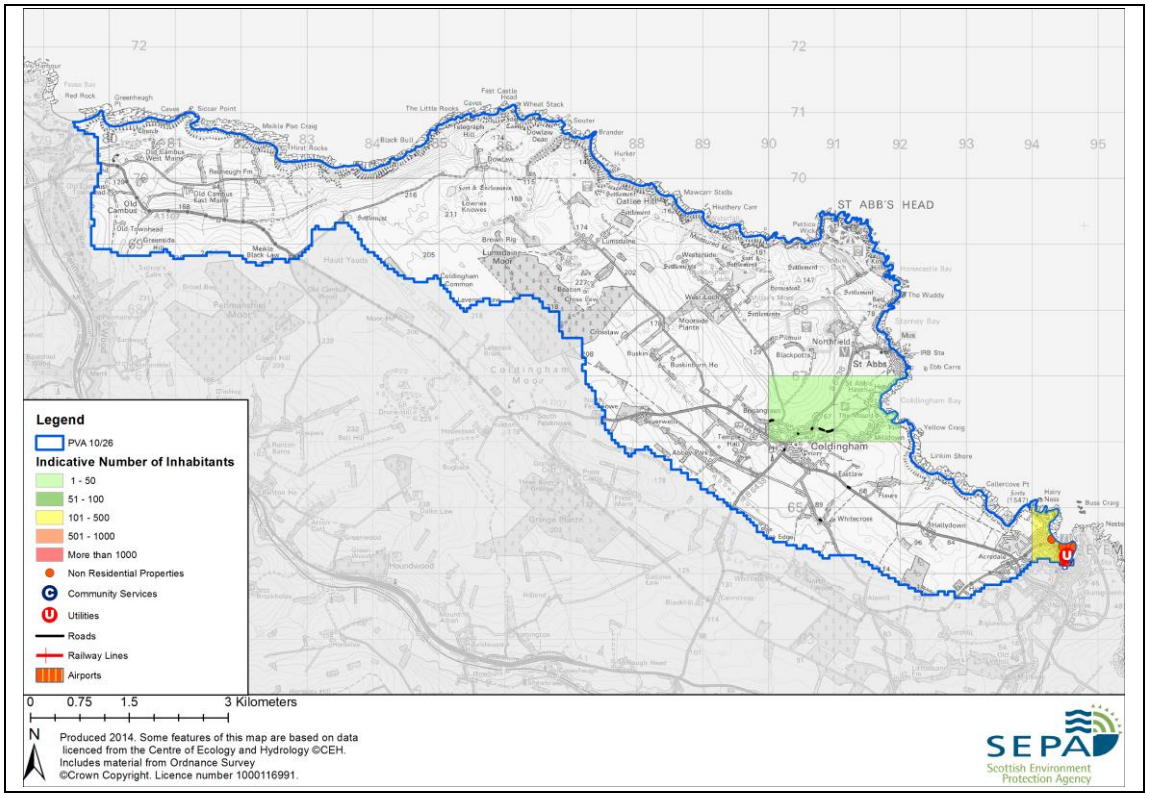


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river floods have been identified as significant in this Potentially Vulnerable Area:

- 7 January 2005: Combination of river and coastal flooding affecting properties at Harbour Road and various other premises in Eyemouth;
- 12 August 1948: Seven railway bridges and two road bridges washed away. Multiple buildings flooded. Railway destroyed. Long term restrictions on travel. The flood event is known to have occurred on Eye Water;
- 12 August 1948: Mill mostly destroyed after the Eye Water burst through railway embankment and flowed through Penmanshiel Tunnel into Pease Glen. Seven railway bridges and two road bridges washed away. Multiple buildings flooded;
- 12 August 1948: Water inundated Eyemouth up to the second floor of some buildings. Harbour completely awash, houses evacuated at harbour. Thought to be greater than a 1 in 200 year flood event in Eyemouth.

The following coastal floods have been identified as significant in this Potentially Vulnerable Area:

- 4 January 2014: A tidal surge combined with a storm surge affected coastal areas across the east of Scotland, particularly around the Forth Estuary;
- 5 December 2013: A 1.0m North Sea surge combined with a high spring tide of 5.4m caused flooding along the east coast and Eyemouth in particular was affected. Almost all of Harbour Road in Eyemouth was inundated. Approximately 10 properties were flooded, less than may have been expected as a result of Council and property owner preventative action;

- 30 and 31 March 2010: A tidal surge coinciding with highest mean tides of the year caused extensive flooding along the east coast of Scotland, with the Firth of Forth being one of the worst affected areas. Locations within this coastal area affected include Leith, Musselburgh, Prestonpans, Port Seton, Dunbar, Eyemouth and North Berwick. Impacts included flooding of properties, damage to harbours, seawalls and roads;
- 22 October 2002: A storm caused combined fluvial and coastal flooding in Eyemouth. Impacts included flooding of properties in Harbour Road and the High Street;
- 1881: The 'Eyemouth Disaster' when 191 fisherman died at Eyemouth.

The following surface water floods have been identified as significant in this Potentially Vulnerable Area:

- 25 July 2013: Flooding in Albert Road, Church Street and Harbour Road, Eyemouth resulting in both residential and commercial property flooding;
- 28 June 2012: Flooding in Albert Road, Church Street and Harbour Road, Eyemouth resulting in both residential and commercial property flooding.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

There is one flood warning target area within this Potentially Vulnerable Area:

- Eyemouth Coastal - Coastal flood warning, Firth of Forth and Tay.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government, the Scottish Flood Forum and the Tweed Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following community groups are known to help with flood resilience within this Potentially Vulnerable Area:

- Eyemouth Resilient Community Group
- St Abbs Resilient Community Group.

The following local incentives or subsidies have been put in place in order to provide property owners with property level resilience/resistance actions:

- Scottish Borders Council provides and maintains sandbag stores in areas of flood risk which are open to the public at any time. Currently there are 27 sites in operation, mainly located in Fire Stations
- Scottish Borders Council subsidises flood protection products for residential and non-residential property owners in flood risk areas.

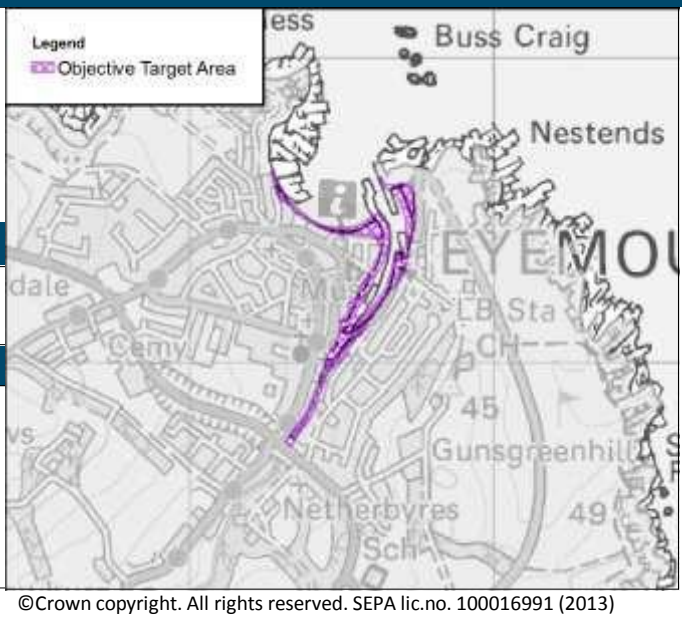
Berwickshire Coast
Potentially Vulnerable Area 10/26
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Eyemouth	Reduce economic damages to residential and non-residential properties in Eyemouth caused by coastal flooding.	10084

Berwickshire Coast
Potentially Vulnerable Area 10/26
Objectives and potential actions

Objective(s):	Eyemouth objective target area
Reduce economic damages to residential and non-residential properties in Eyemouth caused by coastal flooding.	
Objective ID:	
10084	
Indicators:	
£89,000 annual average damages (residential properties) £45,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Wave attenuation	100840800	*Wave attenuation uses the natural characteristics of coastal land cover either to reduce the impact of waves and coastal erosion, or to act as a physical barrier to tidal waters.*
Construction of direct flood defences	100841400	Within Eyemouth, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100841700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100842100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100842200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*
Relocation	100840200	Some of the properties that have been identified to be at risk of flooding may be suitable for relocation. *Relocation of properties or infrastructure may be applicable in locations where frequent flooding is expected and where areas may otherwise be difficult or uneconomical to protect.*

Berwickshire Coast (Potentially Vulnerable Area 10/26)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Flood warning schemes	100841800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	There is a SEPA coastal flood warning scheme in place for Eyemouth. There is also a flood warning scheme in place for Grantshouse to Eyemouth for the Eye Water. These schemes are ongoing.	SEPA	SEPA
Maintain Eye Water flood warning scheme.	100993311810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the needs of the local community.	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Maintain Firth of Forth and Tay flood warning scheme.	100993491810	This action has been identified for all existing flood warning schemes. It will be appropriate where the existing scheme meets the	Ongoing	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		needs of the local community.		aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Property level protection	100841700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths less than 0.6m in areas of high probability flooding.	Scottish Borders Council operates a subsided flood products scheme to assist property owners to implement property level protection where this will reduce flood risk. This scheme is ongoing. The effectiveness of property level protection is dependent on availability of flood warnings.	Scottish Borders Council's Capital Budget. Self-funded by Property Owners	Property Owner
Self help / awareness raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding.	Ongoing	Individuals, businesses, organisations and communities. SEPA Scottish Borders Council's Revenue Budget.	Individuals, businesses, organisations and communities. SEPA (awareness raising, flood warnings) Scottish Borders Council (awareness raising, flood warnings, subsidised flood products scheme

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		They focus on awareness and understanding of the flood risk.			and resilient communities groups)
Emergency planning	-	Emergency response plans are applicable for all sources of flooding. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	Scottish Borders Council East Lothian Council Emergency Services
Land use planning	-	Application of national and local planning policies including objectives and actions Local Plan District development plan	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	Scottish Borders Council East Lothian Council
Maintenance of existing coast protection scheme	-	Existing seawall defences in Eyemouth provide coastal erosion and flood protection to residential and non-residential properties.	Ongoing	Scottish Borders Council's Revenue Budget	Scottish Borders Council
Watercourse Maintenance	-	Watercourse clearance and repair can prevent debris accumulating within channels, which may otherwise result in increased flood risk. This can be undertaken as a regular planned activity or in response to a flood event.	Ongoing	Proportional funding by appropriate Council's Revenue Budgets where responsibility for clearance and repair lies with the Local Authority and works will substantially reduce flood risk.	Scottish Borders Council East Lothian Council Property Owner

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.					
Relocation of properties/infrastructure away from flood risk areas	100840200	Some of the properties that have been identified to be at risk of flooding may be suitable for relocation. Relocation of properties or infrastructure, currently at risk of flooding, away from the flood risk area may be applicable in locations where frequent flooding is expected to a limited area that may be otherwise difficult or uneconomical to protect.	This is a shorted listed potential action which will be subject to further appraisal. If the action is identified as a priority, the delivery and timing will be depending on the funding settlement from Scottish Government. There is currently no provision in Scottish Borders Council's capital plan to 2024/25.	Scottish Borders Council's Capital Budget and Scottish Government's Capital Budget.	Scottish Borders Council
Wave attenuation	100840800	Wave attenuation actions use the natural characteristics of different types of coastal land cover to either reduce the impact of waves and coastal erosion or to act as a physical barrier to tidal waters.	This is a shorted listed potential action which will be subject to further appraisal. If the action is identified as a priority, the delivery and timing will be depending on the funding settlement from Scottish Government. There is currently no provision in Scottish Borders Council's capital plan to 2024/25.	Scottish Borders Council's Capital Budget and Scottish Government's Capital Budget.	Scottish Borders Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Construction of Direct flood Defences	100841400	Within Eyemouth, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event. Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.	This is a shorted listed potential action which will be subject to further appraisal. If the action is identified as a priority, the delivery and timing will be depending on the funding settlement from Scottish Government. There is currently no provision in Scottish Borders Council's capital plan to 2024/25.	Scottish Borders Council's Capital Budget and Scottish Government's Capital Budget.	Scottish Borders Council
Site protection plans	100842100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	This is a shorted listed potential action which will be subject to further appraisal. If the action is identified as a priority, the delivery and timing will be depending on the funding settlement from Scottish Government. There is currently no provision in Scottish Borders Council's capital plan to 2024/25.	Scottish Borders Council's Capital Budget and Scottish Government's Capital Budget.	Scottish Borders Council
Modelling and other assessments to improve knowledge of flood hazards	100842200	Improved knowledge of the risks from different events helps to develop plans to	A Shoreline Management Plan for the Berwickshire Coast	Scottish Borders Council's Revenue Budget.	Scottish Borders Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
and impacts		avoid or mitigate future flooding to sensitive areas.	will be developed in 2016 followed by a Coastal Flood Study for Eyemouth in 2017 and 2018.		
Improve Eye Water flood warning scheme	100993311821	This action has been identified because it is technically possible to improve the existing flood warning scheme. It will be selected where the costs of improvement are justified based on the potential benefits.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Simplify Eye Water flood warning scheme	100993311830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Improve signup of Firth of Forth and Tay flood warning scheme	100993491822	This action has been identified because the sign-up rate in some of the FWTAs within this scheme is less than the target of 40%.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in	SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		If the action is progressed, the sign-up rate for the relevant FWTAs will be improved via a targeted communications campaign.	relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	
Simplify Firth of Forth and Tay flood warning scheme	100993491830	This action has been identified because other structural actions are being considered in this area which may reduce the need for a detailed flood warning scheme.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA

South Gyle, Broxburn and Bathgate (Potentially Vulnerable Area 10/27)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	West Lothian Council, City of Edinburgh Council	River Almond

Background

This Potentially Vulnerable Area covers an area of 154km^2 and is situated in the lower reaches of the River Almond catchment (Figure 1). It includes the western areas of Edinburgh including Edinburgh Airport and South Gyle, and Bathgate, Broxburn and Livingston. Its main watercourses are the River Almond and its tributaries the Brox Burn and the Gogar Burn.

The main source of flooding is surface water (Figure 2). The highest risk of river flooding is from the Gogar Burn, Brox Burn and the River Almond to South Gyle (Edinburgh), Broxburn and Kirkliston. The highest risk of surface water flooding is in Edinburgh, Broxburn, Livingston and Bathgate.

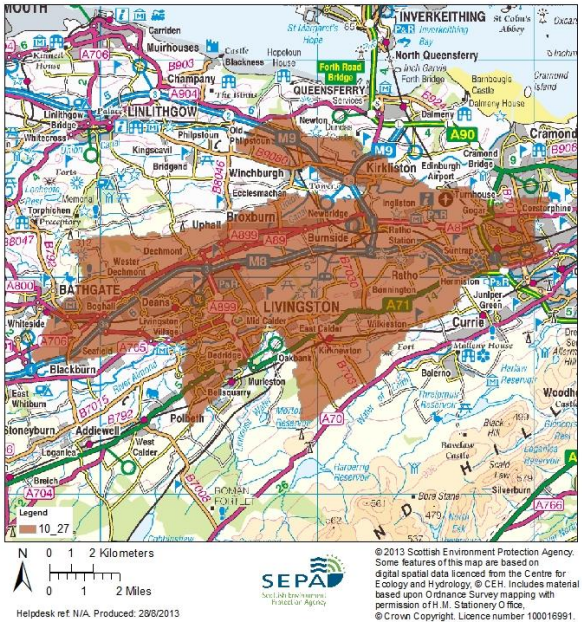


Figure 1: South Gyle, Broxburn, Bathgate Potentially Vulnerable Area

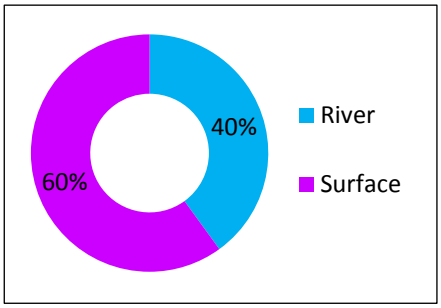


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 1,600 residential properties and 260 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts of flooding from all sources during a medium likelihood event can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £2.0 million. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	130	1,600	1,9080
No. of non-residential properties	70	260	290
No. of people	290	3,400	4,100
Community facilities	0	<10 Educational buildings <10 Emergency services buildings	<10 Educational buildings <10 Emergency services buildings
Utilities	20 Energy sites	70 Energy sites <10 Communications sites	90 Energy sites <10 Communications sites
Transport links (excluding minor roads)	19 roads affected at 352 locations • 2 M roads M8, M9 • 8 A roads • 9 B roads 5 railway routes affected at 64 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions • Midcalder Junction to Holytown Junction • Carstairs to Edinburgh • Drumgelloch to Newbridge Junction	19 roads affected at 540 locations • 2 M roads M8, M9 • 8 A roads • 9 B roads 5 railway routes affected at 120 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions • Midcalder Junction to Holytown Junction • Carstairs to Edinburgh • Drumgelloch to Newbridge Junction Edinburgh Airport	20 roads affected at 615 locations • 2 M roads M8, M9 • 9 A roads • 9 B roads 5 railway routes affected at 123 locations • Fife Circle, Dalmeny to Winchburgh and Haymarket West Junctions • Midcalder Junction to Holytown Junction • Carstairs to Edinburgh • Drumgelloch to Newbridge Junction Edinburgh Airport
Environmental designated areas (km^2)	0	0	0
No. of cultural heritage sites	15	16	17
Agricultural land (km^2)	3.5km^2	5.0km^2	5.3km^2

Table 1: Summary of flooding impacts

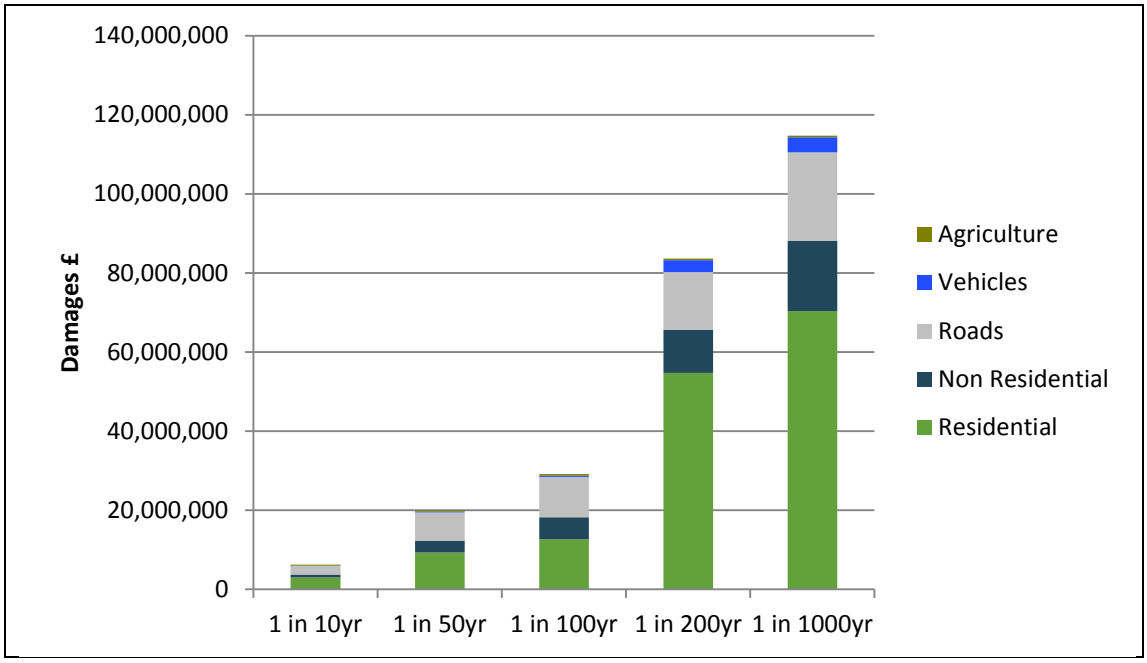


Figure 3: Damages by flood frequency

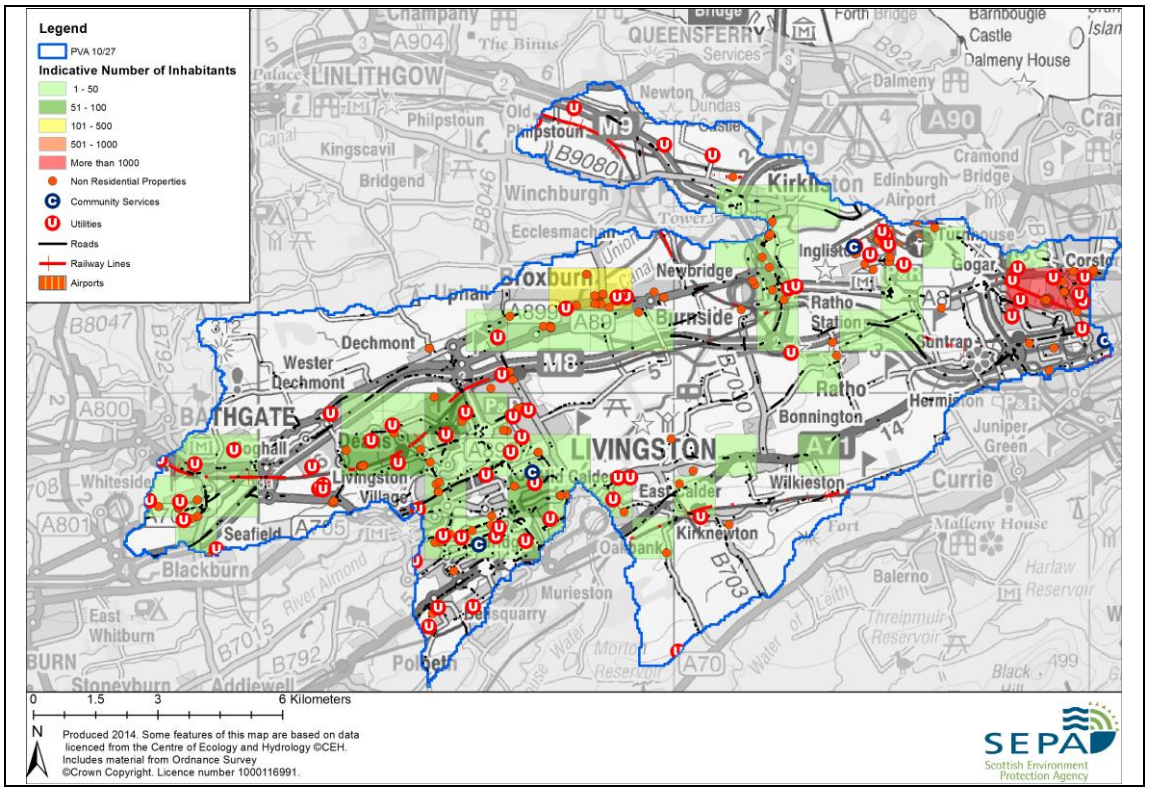


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river floods have been identified as significant in this Potentially Vulnerable Area:

- 20 August 2008: Over 100 properties flooded. At least 5 businesses were also affected;
- 2004 and 2005: A series of flood events in Broxburn resulted in the promotion of the Broxburn Flood Prevention Scheme;
- 8 November 2000: High levels on the River Almond caused flooding at Kirkliston;
- 26 April 2000: High levels on the Gogar Burn caused flooding at Edinburgh Airport and nearby hotel.

No significant coastal or surface water floods have been recorded in this Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There is one formal flood protection scheme in this Potentially Vulnerable Area. This is the Broxburn Flood Protection Scheme which reduces the risk of river flooding.

Other actions and natural features may also reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. This includes the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following community groups are known to help with flood resilience within this Potentially Vulnerable Area:

- East Burnside Village Community Flood Action Group, Broxburn.

The following local incentives or subsidies have also been put in place in order to provide property owners with property level resilience/resistance actions:

- The City of Edinburgh Council owns 450m of temporary pallet barriers that can be utilised to protect properties from river flooding. The Council has 8,000 sandbags and there are a further 1,500 sandbags located in fire stations throughout the City which can be utilised by the public during flood events. The Council operates Emergency Action Packs that are used to determine where people should be deployed during flood events.
- West Lothian Council provides sandbags for public use during an emergency situation. Sandbags and ‘Aquasacs’ are stored at key fire stations throughout the Council area.

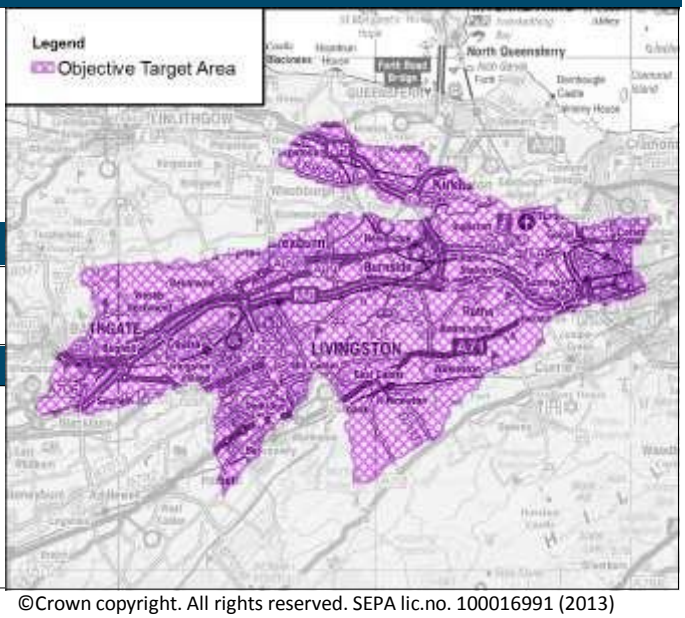
South Gyle, Broxburn, Bathgate Potentially Vulnerable Area 10/27 Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

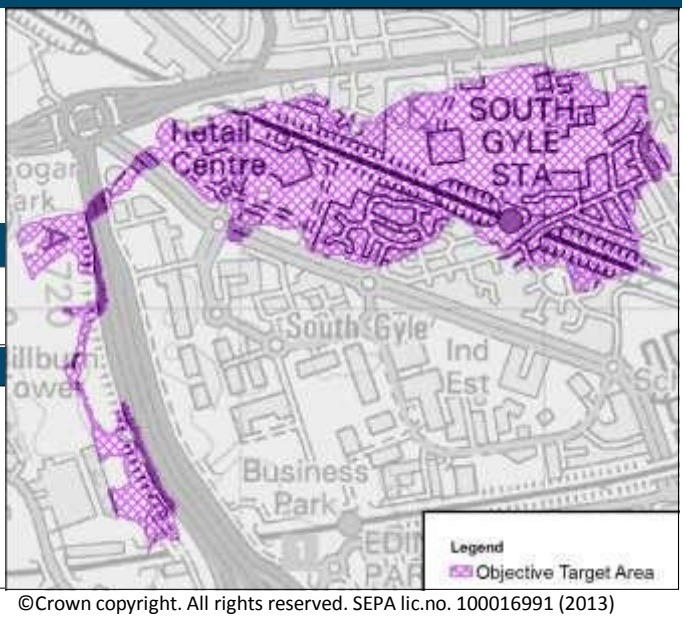
Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Remainder of the Potentially Vulnerable Area	Reduce economic damages to residential and non-residential properties caused by river flooding.	10087
Edinburgh	Reduce economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Gogar Burn.	10088
Broxburn	Accept that significant flood risk in Broxburn is managed appropriately. Maintain existing actions that reduce economic damages to residential and non-residential properties in Broxburn caused by flooding from the Brox Burn.	10089
Remainder of the Potentially Vulnerable Area	Reduce risk to community facilities caused by river flooding.	10090
Broxburn and South Gyle	Reduce risk to people from river flooding in Broxburn and South Gyle.	10091
Broxburn, West Main Street	Reduce economic damages to residential and non-residential properties in Broxburn, West Main Street, caused by flooding from the Brox Burn.	10096

South Gyle, Broxburn, Bathgate Potentially Vulnerable Area 10/27 Objectives and potential actions

Objective(s):	Remainder of the PVA objective target area
Reduce economic damages to residential and non-residential properties caused by river flooding.	
Objective ID:	
10087	
Indicators:	
£94,000 annual average damages (residential properties) £51,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Sediment management	100870700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of direct flood defences	100871400	The potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100871700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100872100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100872200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

South Gyle, Broxburn, Bathgate Potentially Vulnerable Area 10/27 Objectives and potential actions

Objective(s):	Edinburgh objective target area
Reduce economic damages to residential and non-residential properties in Edinburgh caused by flooding from the Gogar Burn.	

Objective ID:

10088

Indicators:

£290,000 annual average damages (residential properties)

Potential action	Action ID	Description
Runoff control	100880500	Upstream of Edinburgh an area with the potential to be used for runoff control has been identified. This could offer some reduction in flood risk along the Gogar Burn and some drains for high likelihood floods. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
Sediment management	100880700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of online and offline storage	100881000	Upstream of Edinburgh land with the potential to be used for online or offline storage has been identified. This could offer a reduction in flood risk along the Gogar Burn for medium likelihood floods. *Flood storage actions retain water in the upper catchment or away from the watercourse, reducing the level and flow in the river. The benefit of these actions decreases further downstream although they can be designed to benefit multiple communities.*
Modification of conveyance	100881100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Construction of direct flood defences	100881400	Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Site protection plans	100882100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

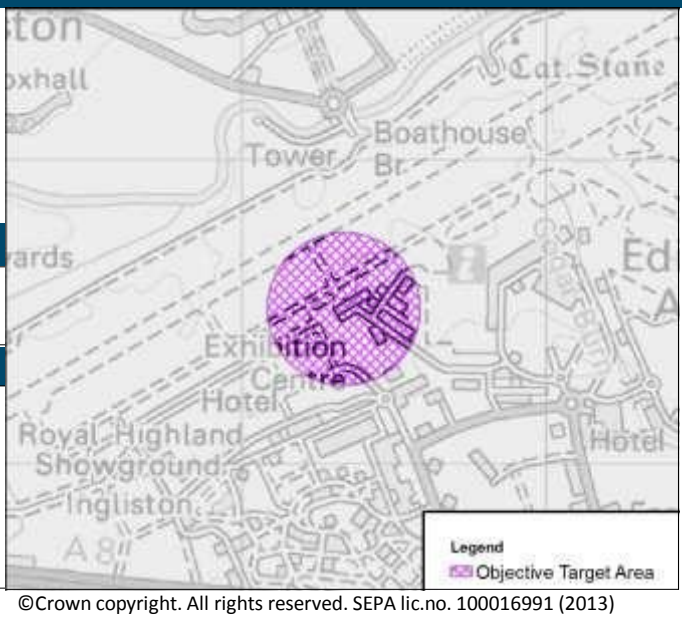
Improved understanding	100882200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

South Gyle, Broxburn, Bathgate Potentially Vulnerable Area 10/27 Objectives and potential actions

Objective(s):	Broxburn objective target area
Accept that significant flood risk in Broxburn is managed appropriately. Maintain existing actions that reduce economic damages to residential and non-residential properties in Broxburn caused by flooding from the Brox Burn.	
Objective ID:	
10089	
Indicators:	
£190,000 annual average damages (residential properties) and£15,000 annual average damages (non-residential properties) avoided.	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100890100	Existing defences along the Brox Burn provide protection to residential and/or non-residential properties up to a 75 year flood plus an allowance for climate change. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Site protection plans	100892100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

South Gyle, Broxburn, Bathgate Potentially Vulnerable Area 10/27 Objectives and potential actions

Objective(s):	Remainder of the PVA objective target area
Reduce risk to community facilities caused by river flooding.	
Objective ID:	
10090	
Indicators:	
1 emergency services building (airport fire station)	

Potential action	Action ID	Description
Construction of direct flood defences	100901400	*Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Site protection plans	100902100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100902200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

South Gyle, Broxburn, Bathgate Potentially Vulnerable Area 10/27 Objectives and potential actions

Objective(s):	Broxburn & South Gyle objective target area
Reduce risk to people from river flooding in Broxburn and South Gyle.	
Objective ID:	
10091	
Indicators:	
2,200 people at risk (from a medium Likelihood flood)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100910100	Existing defences along the Brox Burn provide protection to residential and/or non-residential properties up to a 75 year flood plus an allowance for climate change. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Sediment management	100910700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of direct flood defences	100911400	Within Broxburn, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100911700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Improved understanding	100912200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

South Gyle, Broxburn, Bathgate Potentially Vulnerable Area 10/27 Objectives and potential actions

Objective(s):	Broxburn, West Main Street objective target area
Reduce economic damages to residential and non-residential properties in Broxburn, West Main Street, caused by flooding from the Brox Burn.	
Objective ID:	
10096	
Indicators:	
£14,000 annual average damages (residential properties)	

Potential action	Action ID	Description
Maintenance of existing flood protection schemes	100960100	Existing defences along the Brox Burn provide protection to residential and/or non-residential properties up to a 75 year flood plus an allowance for climate change. *Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.*
Sediment management	100960700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of direct flood defences	100961400	Within Broxburn and West Main Street, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100961700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100962100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100962200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

South Gyle, Broxburn, Bathgate (Potentially Vulnerable Area 10/27)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Edinburgh & Lothian Integrated Catchment Study	10052239	An integrated catchment study is being carried out to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding e.g. with the sewer network, watercourses and the sea.	Ongoing. Results of study will be apparent by 2017.	Proportional funding of the study by appropriate Council's Revenue Budget and Scottish Water	Scottish Water led in partnership with City of Edinburgh Council, East Lothian Council, Mid Lothian Council
Edinburgh Surface Water Management Plan	10052238	The area will be covered by a surface water management plan or plans that set objectives for the management of surface water flood risk and identify the most sustainable actions to achieve the objectives.	Ongoing. Results of study will be apparent by 2015.	Proportional funding by appropriate Council's Revenue Budget	City of Edinburgh Council and boundary local authorities
Bathgate Integrated Catchment Study	10085239	An Integrated Catchment Study will be carried out for Bathgate to improve knowledge and understanding of surface water flood risk and interactions with other sources of flooding eg. with the sewer network and watercourses.	Confirmed. Planned to be carried out between 2015 and 2021	West Lothian Council capital investment and Scottish Water investment	Scottish Water led in partnership with West Lothian Council and SEPA
Livingston and Mid-Calder Surface Water Management Plan	10085238	Livingston and Mid-Calder will be covered by a Surface Water Management Plan that sets objectives for the management of surface water flood risk and identifies the most sustainable actions to achieve the objectives.	Ongoing. Recommended actions agreed by all partners identified by 2019	West Lothian Council capital investment	West Lothian Council

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
Broxburn Surface Water Management Plan	100852381	Broxburn will be covered by a Surface Water Management Plan that sets objectives for the management of surface water flood risk and identifies the most sustainable actions to achieve the objectives.	Ongoing. Recommended actions agreed by all partners identified by 2019	West Lothian Council capital investment	West Lothian Council
Maintenance of existing flood protection schemes.	100870100	Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	West Lothian Council revenue allocation	West Lothian Council
Modelling and other assessments to improve knowledge of flood hazards and impacts	100872200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Confirmed	West Lothian Council capital investment	West Lothian Council
Maintenance of existing flood protection schemes	100890100	**Existing defences along the Brox Burn provide protection to residential and/or non-residential properties up to a 75 year event plus an allowance for climate change.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	West Lothian Council revenue allocation	West Lothian Council

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
Maintenance of existing flood protection schemes	100910100	**Existing defences along the Brox Burn provide protection to residential and/or non-residential properties up to a 1 in 75 year event plus an allowance for climate change.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	West Lothian Council revenue allocation	West Lothian Council
Maintenance of existing flood protection schemes	100960100	**Existing defences along the Brox Burn provide protection to residential and/or non-residential properties up to a 1 in 75 year event plus an allowance for climate change.** Ongoing maintenance of existing defences will ensure they continue to offer protection from flooding. This applies to all types of existing defences although appropriate maintenance activities may vary.	Ongoing	West Lothian Council revenue allocation	West Lothian Council
Construction of Direct flood Defences	100961400	**Within Broxburn and West Main Street, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.** Direct defence actions aim to reduce	Confirmed – **works are due for completion March 2015.**	West Lothian Council capital investment	West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.			
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing.	Self-funded. West Lothian Council revenue investment	Individuals, businesses, organisations or communities at risk of flooding. West Lothian Council
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing.	Proportional funding by appropriate Council's Revenue Budgets	City of Edinburgh Council West Lothian Council Emergency Services
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Proportional funding by appropriate Council's Revenue Budgets	City of Edinburgh Council West Lothian Council
Watercourse Maintenance	-	Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing.	Proportional funding by appropriate Council's Revenue Budgets	City of Edinburgh Council West Lothian Council Landowners

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.					
Sediment Management	100870700 100910700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams.		City of Edinburgh Council West Lothian Council
Sediment Management	100880700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Construction of Direct flood Defences	100881400 100901400	**Within Edinburgh, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.** Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Construction of Direct flood Defences	100871400 100911400	**Within Edinburgh and Broxburn, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a**	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		medium likelihood flood event. Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.			
Property level protection	100901700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths <0.6m in areas of high probability flooding.	Awareness raising from SEPA will help property owners determine their required protection levels.		Property owner
Site protection plans	100882100 100902100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Awareness raising from SEPA will help business owners determine their required protection levels.		Business owner
Modelling and other assessments to improve knowledge of flood hazards and impacts	100882200 100902200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		City of Edinburgh Council

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
Modelling and other assessments to improve knowledge of flood hazards and impacts	100872200 100912200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding..		City of Edinburgh Council West Lothian Council
Runoff Control	100880500	**Upstream of Edinburgh an area with the potential to be used for runoff control has been identified. This could offer a limited reduction in flood risk along the Gogar Burn and some drains for high likelihood events.** Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Construction of Online and Offline storage	100881000	**Upstream of Edinburgh land with the potential to be used for online or offline storage has been identified. This could offer a reduction in flood risk along the Gogar Burn for medium likelihood events.** Flood storage actions retain water in the upper catchment or away from the channel, to reduce level and flow in the river. The benefit of these actions decreases further	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		downstream although they can be designed to benefit multiple communities.			
Modification of Conveyance	100881100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	Potential action found by SEPA analysis will be considered if technically viable. At this stage no revenue funding has been indentified to support future work streams		City of Edinburgh Council
Flood warning schemes	100881800 100891800 100901800 100911800 100961800	**The inclusion of these areas of potential hasn't taken into account the feasibility of offering a warning in each location so they will be subject to further screening and analysis of technical, operational and financial feasibility.** Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA
Site protection plans	100872100 100892100 100962100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Awareness raising from SEPA will help property owners determine their required protection levels. Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		Business Owner West Lothian Council

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
Sediment Management	100960700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council
Property level protection	100871700 100911700 100961700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths <0.6m in areas of high probability flooding.	Awareness raising from SEPA will help property owners determine their required protection levels. Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		Property Owner West Lothian Council
Modelling and other assessments to improve knowledge of flood hazards and impacts	100962200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council
Flood Warning	100994341800	Develop new flood warning for properties in Broxburn and Uphall affected by flooding from the Brox Burn. The inclusion of these areas of potential hasn't taken into account the feasibility of offering a warning in each location so they will be subject to further screening and analysis of	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		SEPA

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Action	Action ID	Description	Status and Timing	Funding	Responsibility
		technical operational and financial feasibility.			

Cowdenbeath (Candidate Potentially Vulnerable Area 10/28c)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	Fife Council	River Ore (Fife)

Background

This candidate Potentially Vulnerable Area covers an area of 21km^2 and is part of the Firth of Forth catchment. It includes the urban areas of Cowdenbeath and Bowhill (Figure 1).

The highest risks of river flooding are at Cardenden (Bowhill) from the River Ore and the Den Burn, and at Cowdenbeath from the Lochgelly Burn. The highest risk of surface water flooding is in Cowdenbeath. The flood damages are evenly distributed between surface water and river flooding (Figure 2).

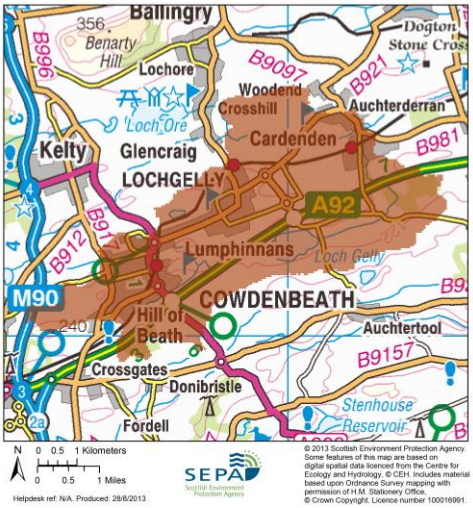


Figure 1: Cowdenbeath candidate Potentially Vulnerable Area

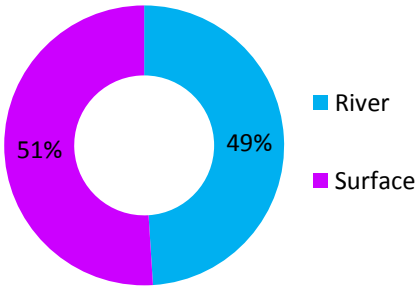


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 170 residential properties and 40 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from all sources of flooding can be seen in Table 1. A map showing the impacts from all sources at a medium likelihood of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £530,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this candidate Potentially Vulnerable Area the highest damages are to non-residential properties followed by damages to residential properties.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	60	150	170
No. of non-residential properties	20	40	50
No. of people	130	330	370
Community facilities	0	0	0
Utilities	<10 Energy sites	<10 Energy sites	<10 Energy sites
Transport links (excluding minor roads)	5 Roads affected at 41 locations • 2 A roads 3 B roads 1 Railway route affected at 4 locations • Fife Circle: Dalmeny to Winchburgh and Haymarket West Junctions	6 Roads affected at 63 locations • M90 • 2 A roads • 3 B roads 1 Railway route affected at 9 locations • Fife Circle: Dalmeny to Winchburgh and Haymarket West Junctions	6 Roads affected at 70 locations • M90 • 2 A roads • 3 B roads 1 Railway route affected at 11 locations • Fife Circle: Dalmeny to Winchburgh and Haymarket West Junctions
Environmental designated areas (km^2)	<0.1km^2 • 1 SSSI	0.1km^2 • 1 SSSI • 1 SPA	<0.1km^2 • 1 SSSI • 1 SPA
No. of cultural heritage sites	0	0	0
Agricultural land (km^2)	0.8km^2	1.0km^2	1.0km^2

Table 1: Summary of flooding impacts

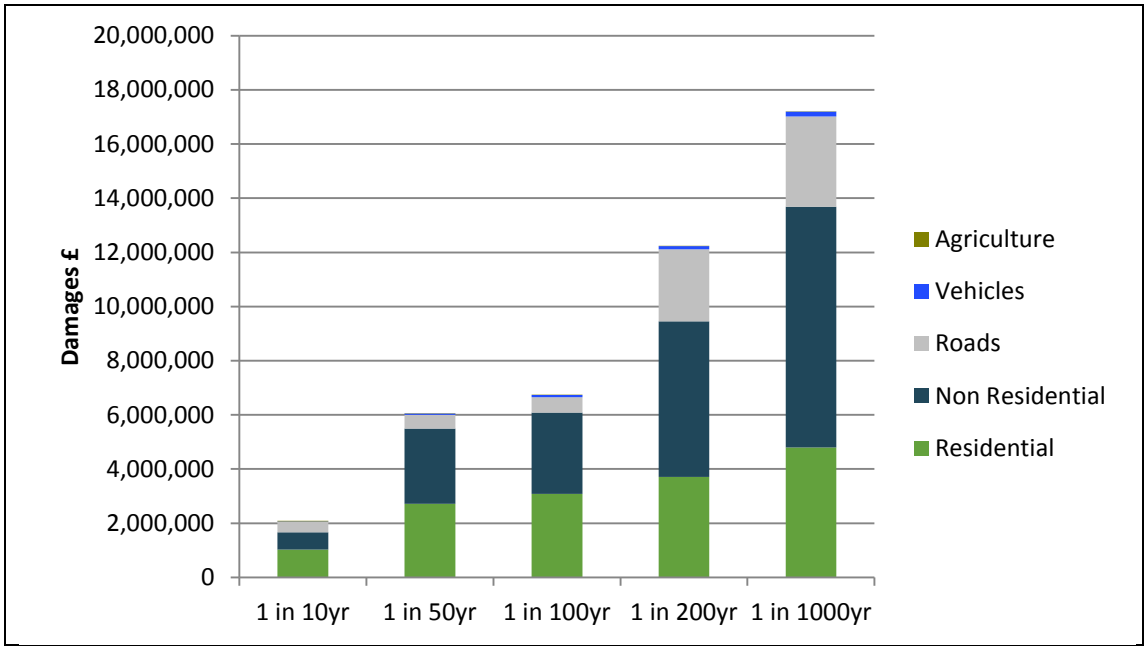


Figure 3: Damages by flood frequency

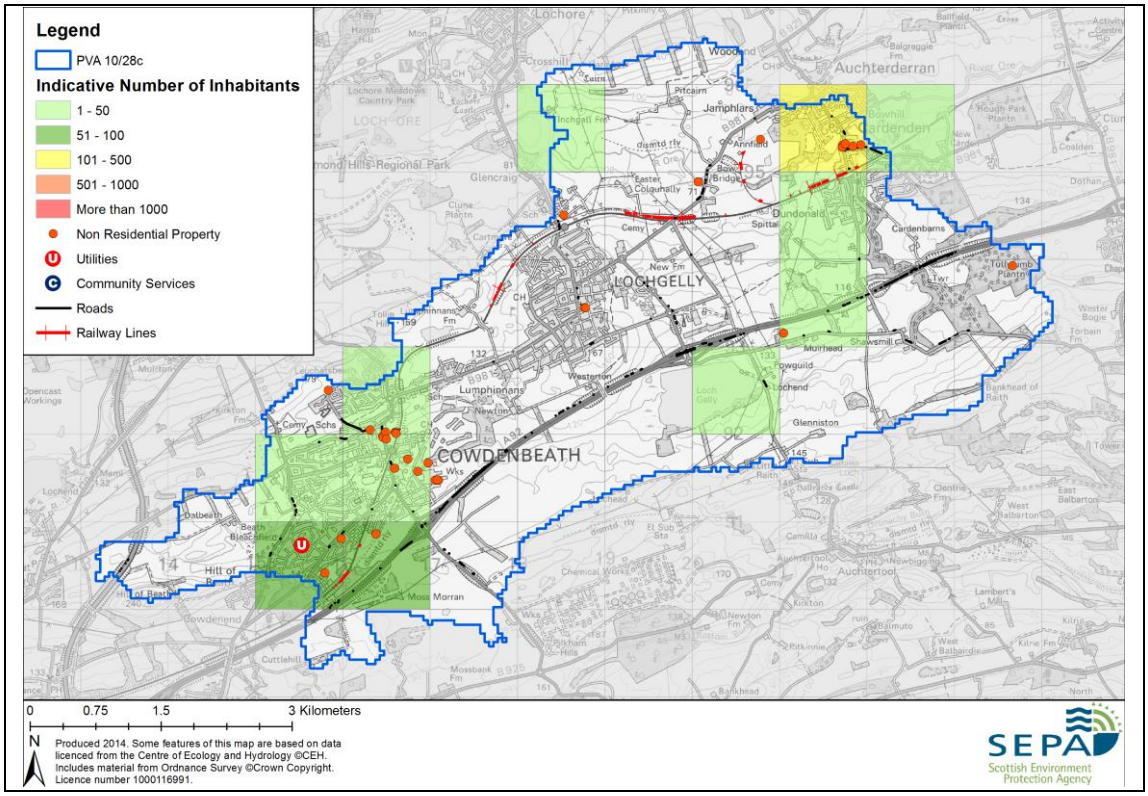


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river flood event has been identified as significant in this candidate Potentially Vulnerable Area:

- 8 February 1903: Roads flooded. Miles of land under water from the Orr and Lochty rivers with the Dunfermline-Thornton junction railway line submerged.

No significant surface water floods have been recorded in this candidate Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this candidate Potentially Vulnerable Area.

However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following incentives or subsidies have been put in place to provide property owners with property level resilience/resistance actions:

- Fife Council provides Aquasacs for use in emergencies and these are available from stores located throughout Fife
- Fife Council also operates an Emergency Flood Plan.

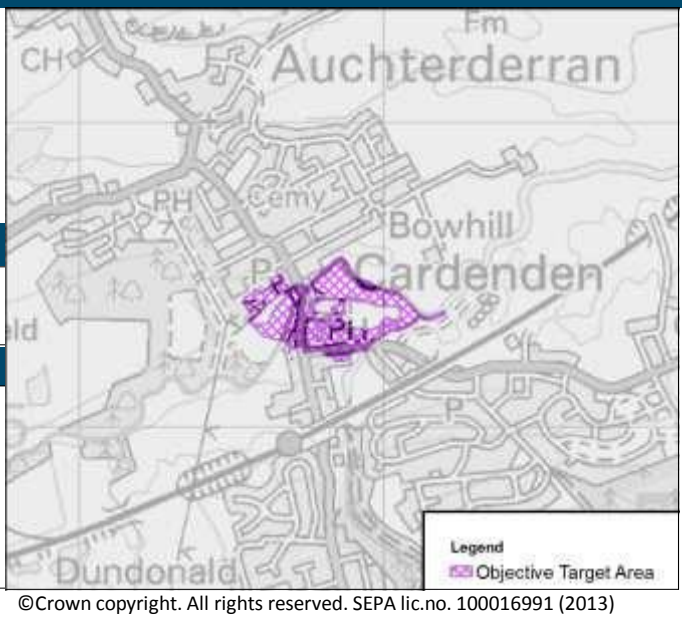
Cowdenbeath
Potentially Vulnerable Area 10/28c
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Cardenden (Bowhill)	Reduce economic damages to residential and non-residential properties from river flooding in Cardenden (Bowhill).	10097
Cowdenbeath	Reduce economic damages to residential and non-residential properties from river flooding in Cowdenbeath.	10098

Cowdenbeath
Potentially Vulnerable Area 10/28c
Objectives and potential actions

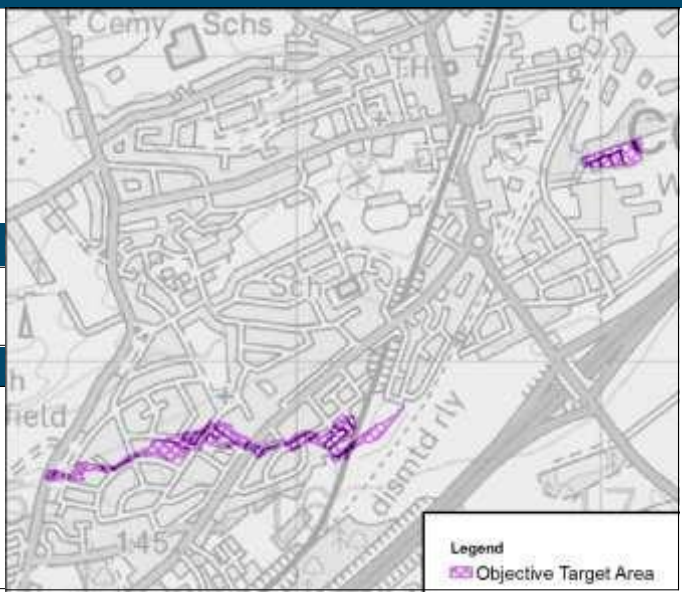
Objective(s):	Cardenden (Bowhill) objective target area
Reduce economic damages to residential and non-residential properties from river flooding in Cardenden (Bowhill).	
Objective ID:	
10097	
Indicators:	
£60,000 annual average damages (residential properties)	

Potential action	Action ID	Description
Runoff control	100970500	Upstream of Cardenden (Bowhill) an area with the potential for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action may not reduce flood risk in the target area. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
River or floodplain restoration	100970600	Upstream of Cardenden (Bowhill) land with the potential to be used for river or floodplain restoration has been identified. This could offer some reduction in flood risk along the Lochfitty Burn and other watercourses for a high likelihood flood. *Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.*
Sediment management	100970700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of online and offline storage	100971000	Upstream of Bowhill land with the potential to be used for online or offline storage has been identified. This could offer a reduction in flood risk along the Lochfitty Burn and other watercourses for medium likelihood floods. *Flood storage actions retain water in the upper catchment or away from the watercourse, reducing the level and flow in the river. The benefit of these actions decreases further downstream although they can be designed to benefit multiple communities.*
Construction of direct flood defences	100971400	Within Bowhill, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*

Cowdenbeath
Potentially Vulnerable Area 10/28c
Objectives and potential actions

Property level protection	100971700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100972100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100972200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Cowdenbeath
Potentially Vulnerable Area 10/28c
Objectives and potential actions

Objective(s):	Cowdenbeath objective target area
Reduce economic damages to residential and non-residential properties from river flooding in Cowdenbeath.	
Objective ID:	
10098	
Indicators:	
£71,000 annual average damages (residential properties) £23,000 annual average damages (non-residential properties)	

Potential action	Action ID	Description
Runoff control	100980500	Upstream of Cowdenbeath an area with the potential to be used for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action may not reduce flood risk in the target area. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
Sediment management	100980700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Construction of online and offline storage	100981000	Storage potential has been identified immediately upstream of the B917 culvert formed by constructing wall/ embankment along west side of road. *Flood storage actions retain water in the upper catchment or away from the watercourse, reducing the level and flow in the river. The benefit of these actions decreases further downstream although they can be designed to benefit multiple communities.*
Construction of direct flood defences	100981400	Construction of wall/ embankment to the west side of road adjacent to B917 culvert to form storage upstream of culvert. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100981700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*

Cowdenbeath
Potentially Vulnerable Area 10/28c
Objectives and potential actions

Site protection plans	100982100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*
Improved understanding	100982200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Delivery Plan for Consultation

Cowdenbeath (Potentially Vulnerable Area 10/28c)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Self Help / Awareness Raising	-	Self help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals, businesses, organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on awareness and understanding of the flood risk.	Ongoing. Flooding advice is provided on Fife Council website and via Public information leaflets. These give practical advice and contact information. Fife Council has provided 'Flood Pods' in locations of vulnerable properties which owners can access in times of flood threat. Owners have the right to protect their properties through purchase of property level protection		Fife Council Fife Council Owners
Emergency Plans	-	Emergency response plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where	Ongoing. Flooding is included within Fife Council's Emergency planning procedures		Fife Council Emergency Services

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		possible.			
Land Use Planning	-	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	Fife Council's revenue budget	Fife Council
Watercourse Maintenance		Watercourse maintenance can prevent debris accumulating within channels, which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing, Pre-flood checks undertaken at critical sites. Inspection and maintenance as required on a regular basis for other locations.	Council Revenue allocation	Fife Council/ Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Runoff Control	100970500	**Upstream of Cardenden (Bowhill) an area with the potential for runoff control has been identified. Further analysis has shown that due to its positioning within the catchment and / or its size, this action will not reduce flood risk in the target area**. Runoff control actions look to	This is a potential action identified through SEPA's strategic option appraisal. Further study/assessment required. Subject to funding availability.		Fife Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding.			
River or floodplain restoration	100970600	**Upstream of Cardenden (Bowhill) land with the potential to be used for river or floodplain restoration has been identified. This could offer a limited reduction in flood risk along the Lochfitty Burn and other watercourses for a high likelihood event.** Restoring the river corridor to a more natural state aims to enhance the capacity of the floodplain to hold back water which can reduce the risk of flooding downstream.	This is a potential action identified through SEPA's strategic option appraisal. Further study/assessment required. Subject to funding availability		Fife Council
Sediment Management	100970700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and	This is a potential action identified through SEPA's strategic option appraisal. Further study/assessment required. Subject to funding availability		Fife Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		other key areas.			
Construction of Online and Offline storage	100971000	**Upstream of Bowhill land with the potential to be used for online or offline storage has been identified. This could offer a reduction in flood risk along the Yarrow Water for medium likelihood events.** Flood storage actions retain water in the upper catchment or away from the channel, to reduce level and flow in the river. The benefit of these actions decreases further downstream although they can be designed to benefit multiple communities.	This is a potential action identified through SEPA's strategic option appraisal. Further study/assessment required. Subject to funding availability		Fife Council
Construction of direct flood defences	100971400	**Within Bowhill, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood event.** Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood	This is a potential action identified through SEPA's strategic option appraisal. Further study/assessment required. Subject to funding availability		Fife Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		risk.			
Property level protection	100971700 100981700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths<0.6m in areas of high probability flooding.>	This is a potential action identified through SEPA's strategic option appraisal. Further study/assessment required. Subject to funding availability		Fife Council
Flood warning	100971800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Not identified.		SEPA
Site protection plans	100972100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Not identified.		

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Improved understanding	100972200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Not identified.		
Runoff Control	100980500	Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions often experience the greatest benefits in areas of high probability flooding.	Not identified.		
Sediment Management	100980700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Not identified.		
Construction of online and offline storage	100981000	**Storage potential has been identified immediately upstream of the B917 culvert formed by constructing wall/ embankment along west side of road**. Flood storage actions retain water in the upper catchment or away from the channel, to	This is a potential action identified through SEPA's strategic option appraisal. Further study/assessment required. Subject to funding availability		Fife Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		reduce level and flow in the river. The benefit of these actions decreases further downstream although they can be designed to benefit multiple communities.			
Construction of direct flood defences	100981400	**Construction of wall/ embankment to the west side of road adjacent to B917 culvert to form storage upstream of culvert**. Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.	This is a potential action identified through SEPA's strategic option appraisal. Further study/assessment required. Subject to funding availability		Fife Council
Flood warning	100981800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Not identified.		SEPA
Site protection plans	100982100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to	Not identified.		

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		existing protection or resilience of the facility or the network.			
Improved understanding	100982200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Not identified.		
Surface Water management planning	10092238	Cowdenbeath, Leuchatsbeath and Lumphinnans covered by a surface water management plan	Ongoing. Recommended actions agreed by all partners identified by 2019. Timing subject to confirmation of funding.		Fife Council
Develop new flood warning. Properties in Bowhill affected by flooding from the River Ore/Kelty Burn.	100994421800	The inclusion of these areas of potential hasn't taken into account the feasibility of offering a warning in each location so they will be subject to further screening and analysis of technical, operational and financial feasibility.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative cost and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	The maintenance of SEPA's flood warning service is funded by Scottish Government through SEPA's grant in aid settlement. In addition, the Government provide grant funding to enable SEPA to implement new flood warning schemes.	SEPA

Whitburn (Candidate Potentially Vulnerable Area 10/29c)

Local Plan District	Local Authorities	Main Catchment
10 Forth Estuary	West Lothian Council	River Almond

Background

This candidate Potentially Vulnerable Area covers an area of 17km^2 and includes Whitburn and Blackburn (Figure 1).

The highest risk of river flooding is from the Cultrig Burn and its extension the White Burn to Whitburn. The highest risk of surface water flooding is in Whitburn. The majority of flood damages are caused by river flooding (Figure 2).

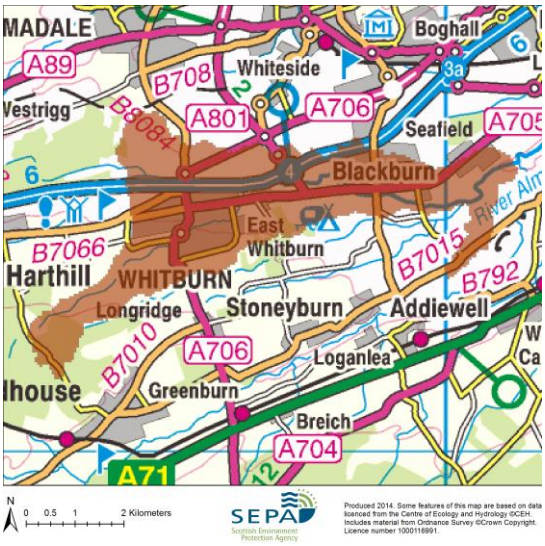


Figure 1: Whitburn candidate Potentially Vulnerable Area

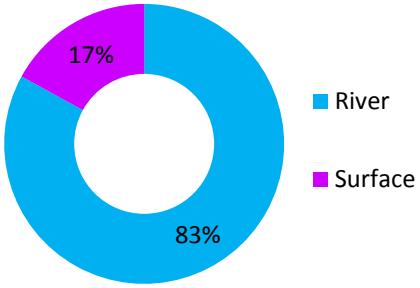


Figure 2: Annual Average Damages by flood source

Summary of flooding impacts

Approximately 170 residential properties and 10 non-residential properties are at a medium likelihood of flooding from one or more sources. A summary of the impacts from flooding can be seen in Table 1. A map showing the impacts from all sources of flooding can be seen in Figure 4.

The total Annual Average Damages from all sources of flooding are approximately £260,000. This includes damages to residential properties, non-residential properties, transport and agriculture. The economic damages incurred for each return period can be seen in Figure 3. For this candidate Potentially Vulnerable Area the highest damages are to residential properties followed by damages to roads.

In 2010 Scottish Water carried out a Flood Risk Assessment Study of water and wastewater assets across Scotland. Of the assets assessed, one wastewater asset was identified as being at risk of flooding within this Potentially Vulnerable Area.

	High likelihood	Medium likelihood	Low likelihood
No. of residential properties	10	170	190
No. of non-residential properties	<10	10	20
No. of people	20	370	420
Community facilities	0	0	0
Utilities	<10 Energy sites	<10 Energy sites <10 Scottish Water assets	<10 Energy sites <10 Scottish Water assets
Transport links (excluding minor roads)	9 Roads affected at 62 locations • M8 • 3 A roads • 5 B roads	9 Roads affected at 102 locations • M8 • 3 A roads • 5 B roads	17 Roads affected at 112 locations • M8 • 3 A roads • 5 B roads
Environmental designated areas (km^2)	0	0	0
No. of cultural heritage sites	0	2	2
Agricultural land (km^2)	0.7km^2	0.8km^2	0.9km^2

Table 1: Summary of flooding impacts

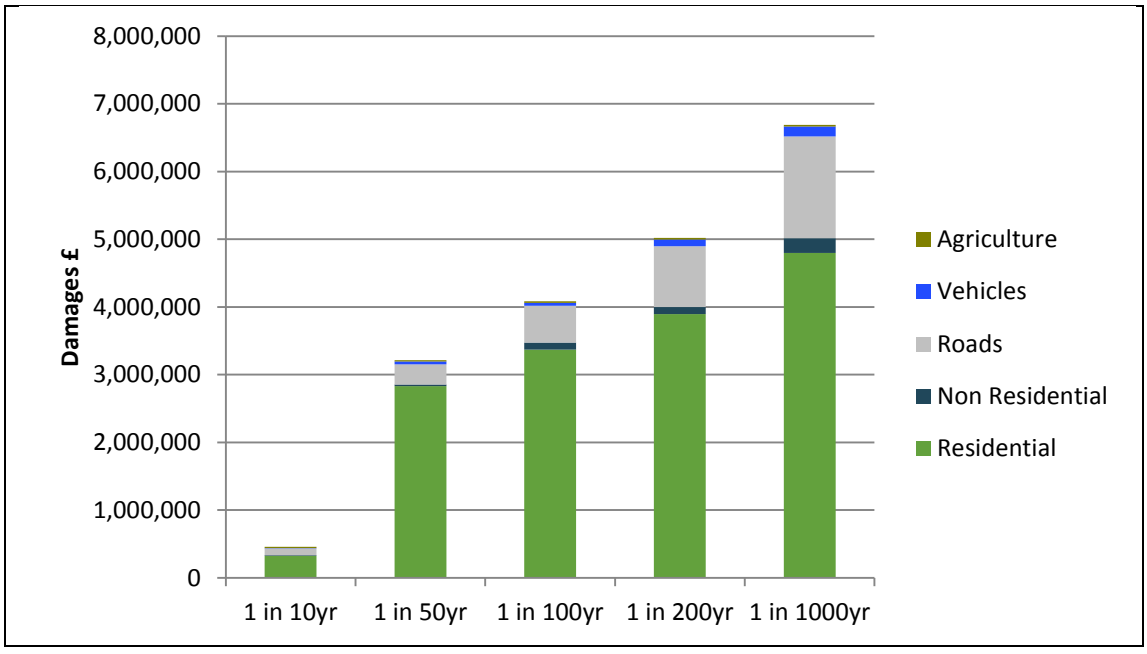


Figure 3: Damages by flood frequency

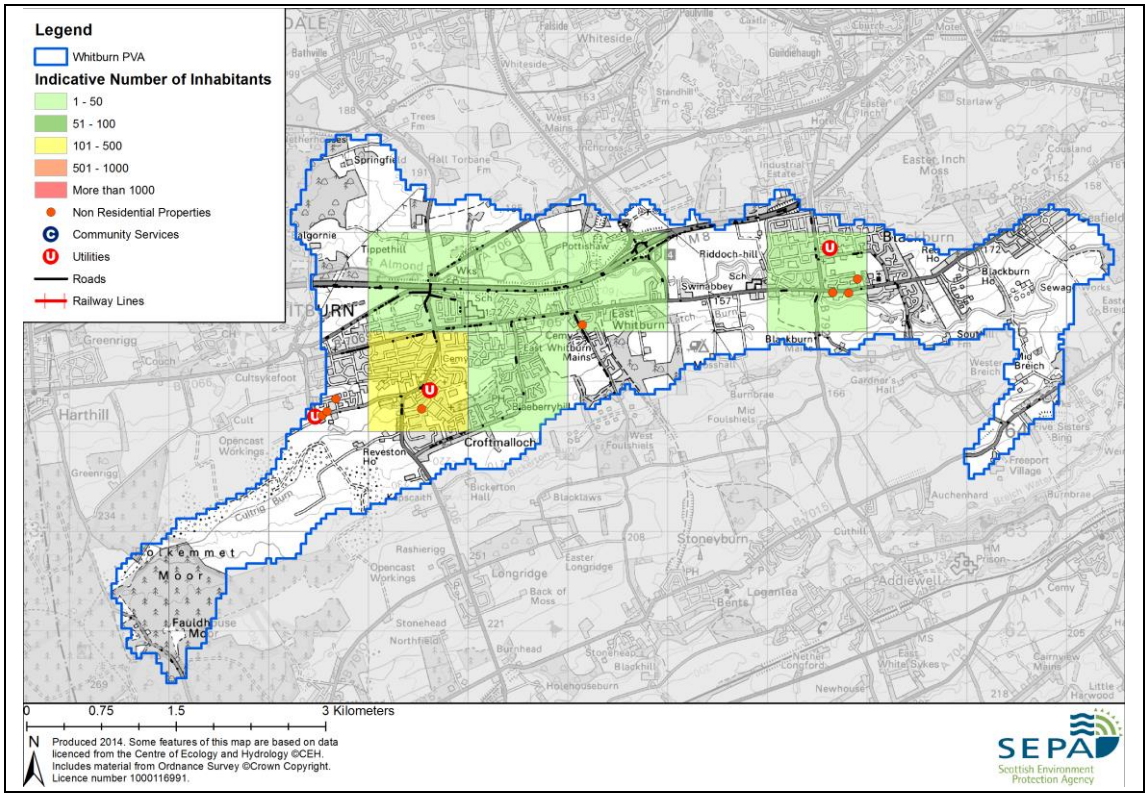


Figure 4: Impacts from all sources at a medium likelihood of flooding

History of flooding

The following river floods have been identified as significant in this candidate Potentially Vulnerable Area:

- 18 January 1909: All the rivers in the southern and central counties of Scotland were in high flood with much of the resulting damage affecting property and livestock at Bathgate
- 1 February 1884: Overtopping on the River Almond resulted in large areas of flooding in Whitburn.

No significant surface water floods have been recorded in this candidate Potentially Vulnerable Area.

Summary of existing local actions to manage risk

There are no formal flood protection schemes in this Potentially Vulnerable Area. However, other actions and natural features may reduce the risk of flooding. These are referenced in the river, coastal and surface water flooding reports.

SEPA and the local authorities work closely with many other organisations that have flooding related duties and interests. These include the police, fire and rescue services, the Scottish Government and the Scottish Flood Forum. SEPA and the local authorities, often in partnership with these organisations, undertake various awareness raising campaigns that include community events, information leaflets, educational plays in schools, the use of social media and advertising.

In addition to the above, the following incentives or subsidies have been put in place to provide property owners with property level resilience/resistance actions:

- West Lothian Council provides sandbags for public use during an emergency situation. Sandbags and ‘Aquasacs’ are stored at key fire stations throughout the council area.

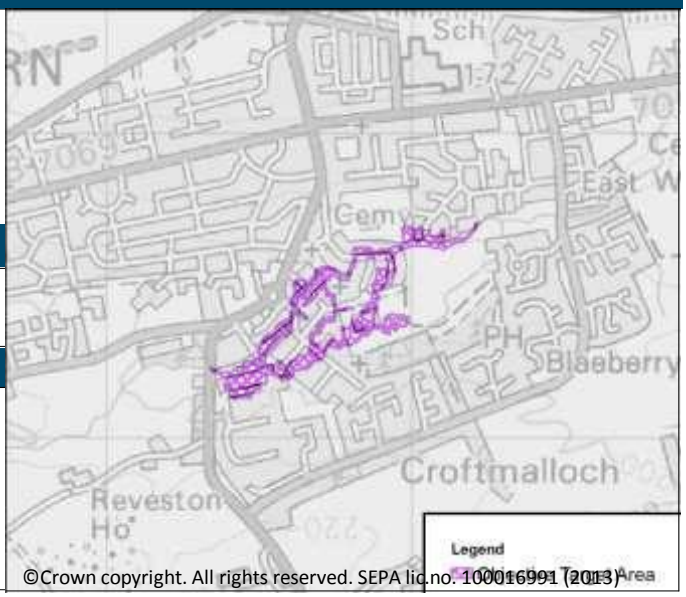
Whitburn
Potentially Vulnerable Area 10/29c
Objectives and potential actions

Unless otherwise stated, information on the following objectives is contained in this document.

IMPORTANT; potential actions that apply across the whole local plan district including flood warning, land use planning, surface water management planning, and other generic actions are described in the Forth Estuary Local Plan District document.

Location	Objective	Objective ID
Applies across Forth Estuary Local Plan District	Avoid an overall increase in flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10001
Applies across Forth Estuary Local Plan District	Reduce overall flood risk. For further information see *Forth Estuary Local Plan District objectives and potential actions*.	10099
Whitburn	Reduce economic damages to residential and non-residential properties in Whitburn caused by flooding from the White Burn.	10094

Whitburn
Potentially Vulnerable Area 10/29c
Objectives and potential actions

Objective(s):	Whitburn objective target area
Reduce economic damages to residential and non-residential properties in Whitburn caused by flooding from the White Burn.	
Objective ID:	
10094	
Indicators:	
£180,000 annual average damages (residential properties)	

Potential action	Action ID	Description
Runoff control	100940500	Upstream of Whitburn an area with the potential to be used for runoff control has been identified. This could offer some reduction in flood risk along the Lochfitty Burn, Drumnagoil Burn and Kelty Burn for high likelihood floods. *Runoff control looks to enhance the ability of the catchment to capture and slow water reaching the receiving watercourses. These actions often achieve the greatest benefits in areas of frequent flooding.*
Sediment management	100940700	*Sediment management can help control the influence of eroded material on flooding by maintaining channel capacity and reducing the impact of siltation.*
Modification of conveyance	100941100	*Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing channel capacity. The potential benefits of these actions are greatest in areas of frequent flooding.*
Construction of direct flood defences	100941400	Within Whitburn, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood flood. *Direct defences aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at risk.*
Property level protection	100941700	Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection. *Property level protection can reduce flood impacts by restricting water entering a property, or using construction techniques which increase the resilience of property to flood water. It is most beneficial for flood depths less than 0.6m, in areas prone to frequent flooding.*
Site protection plans	100942100	*Site protection plans are developed to identify whether normal operation of a facility can be maintained during a flood. This may be due to existing protection or resilience of the facility or the network.*

Whitburn
Potentially Vulnerable Area 10/29c
Objectives and potential actions

Improved understanding	100942200	*Improved knowledge of flood risk informs the development of plans to avoid or mitigate future flooding to sensitive areas.*

Delivery Plan for Consultation

Whitburn (Potentially Vulnerable Area - 10/29c)

Action	Action ID	Description	Status and Timing	Funding	Responsibility
ONGOING AND CONFIRMED ACTIONS. Actions that are either underway or where the funding has been confirmed for 2016-2021.					
Modelling and other assessments to improve knowledge of flood hazards and impacts	100942200	Improved knowledge of the risks from different events helps to develop plans to avoid or mitigate future flooding to sensitive areas.	Confirmed.	West Lothian Council capital investment	West Lothian Council
Self Help / Awareness Raising	10094****	Self-help actions (individuals taking action to protect themselves and their property against flooding) can be undertaken by any individuals businesses organisations or communities at risk of flooding. They are applicable to all sources and probabilities of flooding. They focus on understanding and awareness of the flood risk.	Ongoing	West Lothian Council revenue investment	West Lothian Council
Emergency Plans	10094****	Emergency Response Plans are applicable for all flood sources and likelihoods. They set out the steps to be taken during a flood event to maximise safety and minimise impacts where possible.	Ongoing	West Lothian Council revenue investment	West Lothian Council Emergency Services

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Land Use Planning	10094****	Application of national and local planning policies, including objectives and actions identified in the LPD development plan.	Ongoing	West Lothian Council revenue investment	West Lothian Council
Watercourse Maintenance	10094****	Watercourse maintenance can prevent debris accumulating within channels which may otherwise result in an increased flood risk. It can be undertaken as a regular planned activity or in response to a flood event.	Ongoing	West Lothian Council revenue investment	West Lothian Council Landowners

POTENTIAL ACTIONS. The actions below are being consulted upon to support the process of identifying preferred actions. Preferred actions may not be able to be implemented during the period 2016-2021 due to project lead-in times and / or funding constraints.

Runoff Control	100940500	**Upstream of Whitburn an area with the potential to be used for run-off control has been identified. This could offer a limited reduction in flood risk along the Lochfitty Burn Drumnagoil Burn and Kelty Burn for high likelihood events.** Runoff control actions look to enhance the natural catchment ability to capture and slow runoff water reaching the receiving watercourses. These actions	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.	West Lothian Council

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		often experience the greatest benefits in areas of high probability flooding.			
Sediment Management	100940700	Sediment management can help control the sediment balance in the catchment, maintain channel capacity and reduce the impact of siltation at structures and other key areas.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council
Modification of Conveyance	100941100	Conveyance modification aims to reduce flooding by moving flow more efficiently: speeding it up, removing constrictions or increasing cross sectional area. The potential benefits of these actions are greatest during high probability events.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council
Construction of Direct flood Defences	100941400	**Within Whitburn, the potential to construct direct defences has been identified to reduce the risk to residential and non-residential properties from a medium likelihood event.** Direct defence actions aim to reduce the risk of flooding by placing a designed barrier between the flooding source and the receptors at flood risk.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		West Lothian Council

Delivery Plan for Consultation

Action	Action ID	Description	Status and Timing	Funding	Responsibility
Property Level Protection	100941700	**Some of the properties that have been identified to be at risk of flooding may be suitable for property level protection.** Property level protection can reduce flood impact by restricting water entering a property, or using construction techniques which are resilient to flood water. It is most beneficial for flood depths <0.6m in areas of high probability flooding.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		Property Owners West Lothian Council
Flood warning schemes	100941800	Flood warning actions enable people and organisations to prepare for an event. They enable the risk of the event to be reduced by moving people / possessions out of the floodplain and by placing temporary barriers to reduce flooding impacts.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		SEPA
Site protection plans	100942100	Site protection plans are developed to identify whether normal operation of a facility can be maintained during an event. This may be due to existing protection or resilience of the facility or the network.	Potential actions are drawn from a short list of options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		Business Owners West Lothian Council
Flood Warning	100994441800	Develop new flood warning	Potential actions are drawn from a short list of		SEPA

Action	Action ID	Description	Status and Timing	Funding	Responsibility
		for properties in Whitburn affected by flooding from the White Burn. The inclusion of these areas of potential hasn't taken into account the feasibility of offering a warning in each location so they will be subject to further screening and analysis of technical, operational and financial feasibility.	options that are undergoing further analysis in terms of their relative suitability, costs and benefit. The delivery and timing of those actions that are identified as being of priority are dependent on funding.		

Term	Acronym	Definition
Actions		Actions, for the purposes of flood risk management, are the measures that will be taken to manage flood risk, such as flood protection schemes or flood warning schemes.
Appraisal		A method designed to set objectives and identify the most sustainable combination of structural and non-structural actions to tackle flooding from rivers, the coast and urban surface water.
Appraisal baseline		Defines the existing level of flood risk under the current flood risk management regime.
Area of benefit		An area which has benefited from a flood defence and is now at a reduced risk of flooding relative to the scheme's standard of protection.
Asset management		The process of effectively managing all flood risk assets, such as pumping stations, walls and river banks.
Annual Average Damages	AAD	An indicative estimate of the direct economic costs of flooding impacts to residential properties, non-residential properties and agriculture. It provides a long-term, average estimate of costs derived using nationally held datasets. Scottish figures are based on the method set out in the Flood Hazard Research Centre's Multi-Coloured Handbook. This is the methodology employed by Defra, the Environment Agency and SEPA. In the FRM Strategies they are derived from the estimated economic damages from all sources of flooding to the following receptors: agriculture, residential properties (direct and indirect), non-residential properties, vehicles, emergency services and roads within the area.
Catchment / catchment area		All the land drained by a river and its tributaries.

Candidate Potentially Vulnerable Area	cPVA	Candidate PVAs are those areas identified after the National Flood Risk Assessment (2011) as a result of new information where the impact of flooding is potentially sufficient to justify further assessment and appraisal. and will be considered for inclusion as new PVAs in the next flood risk management planning cycle.
Channel (capacity) improvement		Where work has been carried out on a river channel allowing an increase in the volume of water it can carry.
Characterisation		Provides a description of the natural characteristics of catchment, coastlines and urban areas in terms of hydrology, geomorphology, topography and land use. It also includes the characterisation of existing levels of flood risk and existing flood risk management activity.
Climate change adaptability		The ability to adjust to the effects of climate change and reduce the risks posed by climate change to people's lives and livelihoods.
Coastal flooding		Flooding that results from sea level rise or a combination of high tides and stormy conditions.
Colluvium		A general name for loose, unconsolidated sediments that deposited at the base of hillslopes by either rainwash, sheetwash, slow continuous downslope creep, or a variable combination of these processes
Combined sewer overflow	CSO	A purposely-designed structure to ensure any excess water from sewerage systems is discharged in a controlled way and at a specific managed location.
Confluence		Where two or more rivers meet.
Cost benefit analysis		A financial technique to express the benefits of the project as a ratio of project costs. This will be applied to actions that are classed as "feasible" in the Flood Risk Management Strategy.
Cross Border Advisory Group	CBAG	The Cross Border Advisory Group provides advice on Flood Risk Management for the Solway-Tweed River Basin District. The Group provides a forum for coordination of FRM activities, including how flood risk on one side of the border is affected by actions and inactions on the other side of the border.
Culvert		A conduit used for the conveyance of a watercourse or surface drainage water under a roadway, railroad, canal or other impediment.

Department for Environment, Food and Rural Affairs. A UK Government Department	Defra	The lead government department responsible for policy and regulations, primarily the rest in the UK, on the environment, food and rural affairs. Is also responsible for minimising the impact of emergencies on food production, fishing and farming.
Deposition		A natural process leading to an accumulation of sediment on a river bed, floodplain or coastline.
Depth		The distance between the water surface and the ground beneath measured in metres.
Diffuse pollution		Pollution which originates from various activities and which cannot be traced to a single source e.g. contaminated run off from built up areas.
Direct damages		Defined in the appraisal process as immediate damages to the receptor as a result of flooding (e.g. damages to the fabric or content of buildings, clean-up costs).
Do-minimum scenario		An option used in cost benefit analysis to act as a baseline for testing all other options. It assumes no active intervention but recognises ongoing maintenance activity.
EC Floods Directive		Directive 2007/60/EC on the Assessment and Management of Flood Risks (EC Floods Directive) builds on and is closely related to the Water Framework Directive. It was transposed into Scots Law by the Flood Risk Management (Scotland) Act 2009.
Ecosystem		An ecosystem is a biological environment consisting of living organisms as well as all the non-living, physical components of the environment with which the organisms interact, such as air, soil, water and sunlight.
Ecosystem services		The benefits that people and communities obtain from ecosystems.
Economic Impact		An assessment of the economic value of the positive and negative effects of flooding and the actions taken to manage floods.
Embankment		An artificial raising of the natural bank height of a water body.
Environmental Impact		A change in the environment that could have a negative or positive effect on the ecosystem.
Environmental Impact Assessment	EIA	Environmental Impact Assessment (EIA) is a process which identifies the potential environmental effects (both negative and positive) of a proposal.
Environmental sites / Environmental designated areas/ environmentally designated sites		Areas formally designated for environmental importance, such as Sites of Special Scientific Interest (SSSI) or Special Areas of Conservation (SAC).

Erosion		A natural process leading to the removal of sediment from a river bed, bank or floodplain or coastline.
Estuarine		Relating to an estuary
Estuarine surge attenuation		How an estuary influences the dissipation of coastal surges caused by tides or weather.
Flash flood		A flash flood is a flood that occurs in a short period of time after high intensity rainfall or a sudden snow melt. A sudden increase in the level and velocity of the water body is often characteristic of these events. Rising water levels in the river network can reach its peak within minutes to a few hours of the onset of the flood event, leaving a short time for warning or actions.
Flashy watercourse		A 'flashy' river or watercourse has a short lag time (the delay between peak rainfall intensity and peak river discharge), high peak discharge, and quickly returns to average flow. Rivers with these characteristics can be more likely to flood and leave a short time for warning or actions.
Flood bund		A constructed retaining wall, embankment or dyke designed to prevent inundation or breaches of water from a known source.
Flood defence		Infrastructure, such as flood walls and embankments, intended to protect an area against flooding, to a specified standard of protection.
Flood event		A flood event can be defined as the period of time flooding is expected, occurring and draining away. It causes significant adverse impacts on people, property, environment or infrastructure and is not a result of regular weather or infrastructure drainage.
Flood extent		The area which has been affected by flooding or is at risk of flooding from one or more sources.
Flood frequency		The probability, or likelihood, that flooding will go beyond the expected parameters in a specific time period. Put simply, how often we expect a flood to happen.
Flood hazard	FH	In terms of the FRM Act, hazard refers to the characteristics (extent, depth, velocity) of a flood.
Flood hazard map		Required by FRM Act to show information that describes the nature of a flood in terms of the source, extent, water level or depth and velocity of water, where appropriate.

Flood Protection Scheme	FPS	Flood defence measures formally promoted under the Flood Prevention (Scotland) Act 1961, and now be taken forward under the FRM Act by a local authority to reduce flood risk from specified sources and help protect communities from the impacts of flooding.
Flood risk	FR	A measure of the combination of the likelihood of flooding occurring and the associated impacts on people, the economy and the environment.
Flood Prevention (Scotland) Act 1961		The Flood Prevention (Scotland) Act 1961 gave local authorities discretionary powers to make and build flood prevention schemes. It was superseded by the Flood Risk Management (Scotland) 2009.
Flood Risk Assessment	FRA	Flood Risk Assessments are detailed studies of an area where flood risk may be present. These are often used to inform planning decisions, develop flood schemes and they also contributed to the National Flood Risk Assessment. They detail site specific flood risk.
Flood Risk Management (Scotland) Act 2009	FRM Act	The flood risk management legislation for Scotland. It transposes the EC Floods Directive into Scots Law and aims to reduce the adverse consequences of flooding on communities, the environment, cultural heritage and economic activity.
Flood Risk Management Local Advisory Groups	FRM LAG	FRM Local Advisory Groups are stakeholder groups convened to advise SEPA and Lead Local Authorities in the preparation of Flood Risk Management Plans. SEPA and Lead Local Authorities must have regard to the advice they provide.
Flood Risk Management Plan	FRM Plan	A term used in the FRM Act. Flood Risk Management Plans set out the actions that will be taken to reduce flood risk in a Local Plan District. They comprise Flood Risk Management Strategies, developed by SEPA, and Local Flood Risk Management Plans produced by Lead Local Authorities.
Flood Risk Management Strategy	FRM Strategies	Sets out a long-term vision for the overall reduction of flood risk. They will contain a summary of flood risk in each Local Plan District, together with information on catchment characteristics and a summary of objectives and actions for Potentially Vulnerable Areas.
Flood risk map		Builds on flood hazard maps providing detail on the impacts of flooding on people, the economy and the environment.
Flood wall		A flood defence feature used to defend an area from flood water.

Floodgate		An adjustable barrier used as a flood defence to control the flow of water within a water system or flood event.
Floodplain		Area of land that borders a watercourse, an estuary or the sea, over which water flows in time of flood, or would flow but for the presence of flood defences and other structures where they exist.
Floodplain storage		This is where flood water may be stored and slowed by natural features of the land.
Flood warning scheme		A Flood Warning Scheme is the network of monitoring on a coastal stretch or river which provides SEPA with the ability to issue Flood Warnings.
Flood warning target area	FWTA	A Flood Warning target area is where SEPA operates a formal Flood Monitoring Scheme to issue targeted Flood Warning messages for properties located in this area.[i]
Fluvial flooding		Flooding from a river or other watercourse.
Gabion		A metal cage filled with rocks to walls often used in river bank protection.
Geographic Information System	GIS	The computer software used to present and generate the flood maps.
Gley soils		A sticky clay soil or soil layer formed under the surface of some waterlogged soils.
Greenhouse gases		Naturally occurring gases, such as carbon dioxide, nitrous oxide, methane and ozone and man-made gases like chlorofluorocarbons, which absorb some of the sun's radiation and convert it to heat.
Groundwater flooding		This type of flooding is caused by water rising up from underlying rocks or flowing from springs. Groundwater is generally a contributing factor to flooding rather than the primary source.
Groyne		A rigid structure built from the shoreline or river bank that interrupts water flow and limits the movement of sediment.
Hummock		A small knoll or mound above ground typically less than 15 metres in height.
Hydrometric areas		Geographic areas designated under the Surface Water Survey (1930's) to help facilitate an approach to the collection of hydro-meteorological data. They are either whole river catchments having one or more outlets to the sea or tidal estuary, or, for convenience, they may include several contiguous river catchments having topographical similarity with separate tidal outlets [ii] There are 107 hydrometric areas in the UK, 45 of which are in Scotland.
Indirect damages		Defined in the appraisal process as those

		incurred subsequently due to flooding i.e. knock on effects such as disruption, evacuation, costs to emergency services, loss of income or earnings/industrial production.
Integrated Pollution Prevention and Control installation	IPPC	Integrated Pollution Prevention and Control installations are usually industrial installations where SEPA permit emissions to the water, air or land.
Interconfluence catchments	ICCs	ICCs are units of management defined to assist in the modelling of floods. They are generated from each confluence on the baseline river network, i.e. where two or more rivers, each with a catchment area greater than 10 km², meet.
Land use planning	LUP	The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and the implications for different communities and interest groups.
Land use vulnerability		This differentiates between a range of land uses by generally taking account of flooding impacts on land uses in terms of their relative susceptibility and resilience to flooding and any wider community impacts caused by their damage or loss.
Lead Local Authority	LLA	A local authority responsible for leading the production, consultation, publication and review of a Local Flood Risk Management Plan.
Local Development Plans	LDP	Each local authority area in Scotland is covered by a Local Development Plan, which sets out where most new developments are proposed and the policies that will guide decision-making on planning applications. The four main city regions in Scotland (Aberdeen, Dundee, Edinburgh and Glasgow) are also covered by a Strategic Development Plan which sets out the long-term development of the city region and deals with region-wide issues such as housing and transport.
Likelihood of flooding		The chance of flooding occurring. **High likelihood**: A flood event that has a 10% chance of happening in any one year. Or, is likely to occur in the defined area on average once in every ten years (1:10). **Medium likelihood:** A flood event that has a 0.5% chance of happening in any one year. Or, is likely to occur in the defined area on average once in every two hundred years (1:200). **Low likelihood:** A flood event that has a 0.1%

		chance of happening in any one year. Or, is likely to occur in the defined area on average once in every thousand years (1:1000). The draft strategy document indicators refer to medium likelihood unless otherwise specified.
Local Flood Risk Management Plans	LFRM Plan	Local Flood Risk Management Plans, produced by Lead Local Authorities, will take forward the objectives and actions set out in Flood Risk Management Strategies. They will provide detail on the funding, timeline of delivery, arrangements and co-ordination of actions at the local level during each 6 year FRM planning cycle.
Local Plan District	LPD	Geographical areas for the purposes of flood risk management planning. 14 Local Plan Districts cover Scotland.
Local Plan District Partnerships	LPD Partnership	Each LPD has established a local partnership comprised of local authorities, SEPA and Scottish Water. These partnerships are distinct from the FRM Local Advisory Groups and they retain clear responsibility for delivery of the FRM actions set out in the Local Flood Risk Management Plans. It is the local partnership that makes decisions and supports the delivery of these plans.
Major flood		Flood affecting large numbers of people or properties, or causing widespread geographical impact and disruption.
Montane habitat		This habitat encompasses a range of natural or near-natural vegetation occurring in the montane zone, lying above or beyond the natural tree-line.
Moraine		A mass of rocks and sediment carried down and deposited by a glacier, typically, but not exclusively, found as ridges at its edges or extremities. Can be used to indicate historical glacial extents.
National Flood Management Advisory Group	NFMAG	The National Flood Management Advisory Group provides advice and support to SEPA and, where required, Scottish Water, local authorities and other responsible authorities on the production of FRM Strategies and Local FRM Plans.
National Flood Risk Assessment	NFRA	A national picture of flood risk from all sources of flooding which also considers climate change impacts. Completed in December 2011 this provides the information required to undertake a strategic approach to flood management that identifies areas at flood risk that require further appraisal. The NFRA will be reviewed and updated for the second cycle

		of FRM Planning by December 2018.
National Grid Reference	NGR	The Ordnance Survey National Grid Reference system of geographic grid references used in Great Britain which the user can use to locate a specific area of interest.
Natural flood management	NFM	A set of flood management techniques that aim to work with natural processes (or nature) to manage flood risk.
Objectives		Measurable goals relating to managing flood risk. The Flood Risk Management Strategies for each of the 14 Local Plan Districts in Scotland will set out objectives to reduce flood risk and actions to achieve those objectives.
One in 200 year flood		A flood that has a probability of being exceeded once every 200 years. Also expressed as a flood which has a 0.5% probability of being exceeded in any year. This is the medium likelihood of flooding as shown in SEPA's flood maps.
One in 200 year standard of protection		A flood defence standard specifies the protection offered to a specific area from flooding from the sea or rivers. It is usually associated with a man-made defence on the coast or in estuaries, with land that has been 'claimed' from the sea (often many centuries ago). In this case a one in 200 flood level is specified as the level to which the defence should be able to provide protection from.
Peaty rankers		Shallow wet soils with an organic surface layer <50cm thick overlying a weakly developed, wet subsoil on to rock. (Soils, 2014)[iii]
Pluvial flooding		Flooding that results from rainfall runoff flowing or ponding over the ground before it enters a natural (e.g. watercourse) or artificial (e.g. sewer) drainage system or when it cannot enter a drainage system (e.g. because the system is already full to capacity or the drainage inlets have a limited capacity). This is referred to as surface water flooding.
Podzols		Soils that develop in a moist climate especially under coniferous or mixed forest. Formed from acidic, coarse textured, well drained materials.
Potentially Vulnerable Areas	PVA	Areas identified as being at risk of flooding and where the impact of flooding is sufficient to justify further assessment and appraisal. 243 PVAs were identified by SEPA in the National Flood Risk Assessment and will be the focus of the first FRM planning cycle.
Preparedness		Degree that an individual or business is ready to take action, which focuses on advance planning rather than reactions or when flooding is imminent.
Prevention		Activities to avoid or minimise the adverse

		impact of flooding.
Primary impacts		Direct impacts of flooding, such as impacts to human health, including risk to life.
Probability		The chance of a flood occurring within a given time. This is also expressed as likelihood of flooding as in the SEPA flood maps.
Pump		A device for moving water by mechanical means, which can be used to manage water levels in areas at risk.
Receptor		Refers to the entity that may be impacted by flooding (a person, property, infrastructure or habitat). The vulnerability of a receptor can be modified by increasing its resilience to flooding.
Residual risk		The risk which remains after risk management and mitigation. This may include risk due to very severe (above design standard) storms or risks from unforeseen hazards.
Resilience		The ability of an individual, community or system to recover from flooding.
Responsible authority	RA	Designated under the FRM (Scotland) Act 2009 and associated legislation as local authorities, Scottish Water and from 21 December 2013 the National Park Authorities and Forestry Commission Scotland. Responsible authorities, along with SEPA and Scottish Ministers, have specific duties in relation to their flood risk related functions.
Restoration of natural flooding processes		This is the return of a landscape, ecosystem, or other ecological entity to a predefined state where the natural flooding processes are uninterrupted.
Return period	RP	The flood return period is a measure of the frequency of an event being equalled or exceeded - the longer the return period, the rarer the event. It is the average length of time (usually in years) separating flood events of a similar or greater magnitude. 1000 year return period floods have a low likelihood of occurring, 200 year return period floods a medium likelihood and 10 year return period floods a high likelihood.
Revetment		Sloping structures placed on banks or at the foot of cliffs in such a way as to deflect the energy of incoming water.
Riparian		The riparian area is the interface between land and a river or stream. For the purposes of FRM this commonly refers to the riparian owner, which denotes ownership of the land area beside a river or stream.
River Basin District		Geographic areas over which River Basin Management and Flood Risk Management Plans are prepared. In Scotland there are two

		River Basin Districts identified under the Water Environment & Water Services (Scotland) Act 2003 (WEWS Act) - one for the Solway/Tweed area and one covering the rest of Scotland.
River Basin Management Planning	RBM Planning	River Basin Management Planning is a strategic decision-making process introduced by the Water Environment & Water Services (Scotland) Act 2003 (WEWS Act) which integrates the management of land and water within River Basin Districts. There are River Basin Management Plans covering each River Basin District.
Run off reduction		Actions within a catchment or sub-catchment to reduce the amount of run-off during rainfall events. This can include intercepting rainfall, storing water, diverting flows or encouraging infiltration.
Scottish Advisory and Implementation Forum for Flooding	SAIFF	The stakeholder forum on flooding set up by the Scottish Government to ensure legislative and policy aims are met and to provide a platform for sharing expertise and developing common aspirations and approaches to reducing the impact of flooding on Scotland's communities, environment, cultural heritage and economy.
Sediment balance		Within a river where erosion and deposition processes are equal over the medium to long-term resulting in channel dimensions (width, depth, slope) that are relatively stable.
Sediment management		Sediment management covers a wide range of activities that includes anything from the small scale removal of dry gravels to the dredging of whole river channels and the reintroduction of removed sediment into the water environment. Historically, sediment management has been carried out for several reasons, including reducing flood risk, reducing bank erosion, for use as aggregate and to improve land drainage.[iv]
Sensitivity testing		Method in which the impact on the output of an analysis is assessed by systematically changing the input values. Often used to see which input values have the strongest effect on outputs.
Sewer flooding and other artificial drainage system flooding		This is flooding which is a result of the sewer or other artificial drainage system (e.g. road drainage) capacity being exceeded by rainfall runoff or when the drainage system cannot discharge water at the outfall due to high water levels (river and sea levels) in receiving waters.

Shoreline Management Plan	SMP	A Shoreline Management Plan is a large scale assessment of the coastal flood and erosion risks to people and the developed, historic and natural environment. It sets out a long-term framework for the management of these risks in a sustainable manner.
Society of Chief Officers of Transportation in Scotland	SCOTS	Strategic body representing Scotland's local authorities and seven regional transport partnerships.
Source of flooding		The type of flooding. This can be coastal, river, surface water or groundwater.
Standard of protection		A flood defence standard specifies the protection offered to a specific area from flooding from the sea or rivers. It is usually associated with a man-made defence on the coast or in estuaries, with land that has been 'claimed' from the sea (often many centuries ago).
Storage area		A feature that can be used to store floodwater, this can be natural in the form of low lying land or manmade such as a large reservoir or modified landform.
Strategic Environmental Assessment	SEA	A process for the early identification and assessment of the likely significant environmental effects, positive and negative, of activities. Often considered before actions are approved or adopted.
Strategic Flood Risk Assessment	SFRA	A Strategic Flood Risk Assessment (SFRA) is designed for the purposes of specifically informing the Development Plan Process i.e. Strategic Development Plans and Local Development Plans. A SFRA involves the collection, analysis and presentation of all existing and readily available flood risk information (from any source) for the area of interest. It constitutes a strategic overview of flood risk.
Surface Water Management Plan	SWM Plan	A plan that takes an integrated approach to drainage accounting for all aspects of urban drainage systems and produces long term and sustainable actions. The aim is to ensure that during a flood event the flows created can be managed in a way that will cause minimum harm to people, buildings, the environment and business.
Surface water run-off		The flow of water from rain, snow melt or other sources over land.
Surface water flooding		Flooding that occurs when rainwater does not drain away through the normal drainage systems or soak into the ground, but lies on or flows over the ground instead[v]
Sustainable development		Sustainable development is an approach to

		resource use that aims to meet human needs, whilst preserving the environment so that it meets the needs of present and future generations. The delivery of sustainable development is generally recognised to require reconciliation of three pillars of sustainability - environmental, social and economic.
Sustainable Flood Risk Management		An approach which involves taking actions now to manage the risk of flooding that are robust enough to stand the test of time. There are three pillars of sustainability that must be considered - environmental, social and economic.
Sustainable Urban Drainage Systems	SUDS	A set of techniques designed to slow the flow of water. It can contribute to reducing flood risk by absorbing some of the initial rainfall and then releasing it gradually, thereby reducing the flood peak and helping to mitigate downstream problems, and manage a useful contribution to flood management. SUDS encourage us to take account of quality, quantity and amenity/biodiversity.
Velocity		The speed and direction that the water travels.
Vulnerability		A measure of how likely someone or something is to suffer long-term damage as a result of flooding. It is a combination of the likelihood of suffering harm or damage during a flood (susceptibility) and the ability to recover following a flood (resilience).
Water table		Upper surface of groundwater below which soil is saturated with water that fills all voids and where the pressure of water in the soil equals the atmospheric pressure.
Water Framework Directive	WFD	The Water Framework Directive (Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy) The WFD establishes integrated river basin management for Europe. It requires all inland and coastal waters to reach "good status" by 2015, or an alternative or delayed objective.
Wave energy dissipation		Process by which a wave loses its mechanical energy
Wave overtopping		Wave overtopping takes place when waves meet a submerged or emerged reef or structure and pass over it.
Whole life cost	WLC	Whole life costing (WLC) takes account of the total cost of an item over its whole life. It includes the cost of maintaining and operating the item and is a mechanism to deliver improved value for money.

i http://www.sepa.org.uk/flooding/flooding_faqs.aspx
ii http://www.ceh.ac.uk/data/nrfa/hydrometry/has.html
iii http://www.soils-scotland.gov.uk/publications/classification
iv www.sepa.org.uk/water SEPA (2010) Engineering in the water environment: good practice guide Sediment management
v http://watermaps.environment-agency.gov.uk/wiyby/wiyby.aspx?topic=ufmfsw#x=357683&y=355134&scale=2