

**Aberdeen City Council
Local Development Plan**

Draft Strategic Flood Risk Assessment

Working Document

Version	Date Updated
1	August 2013
2	November 2013

1. Introduction

SFRA is designed for the purposes of informing the development planning process and to assist in achieving a flood risk reduction by avoiding areas at significant risk of flooding.

The SFRA constitutes a strategic overview of flood risk to the development plan area and should involve the collection, analysis and presentation of all exiting and readily derivable information on flood risk sources. It has been produced in consultation with the Scottish Environmental Protection Agency (SEPA) as well as other Council services.

This SFRA will primarily be used to assist the preparation of the next Local Development Plan, particularly when making our recommendations on preferred sites. It will also contribute to baseline monitoring for SEA, assist in policy development and enable the planning of new flood management schemes.

2. Legislation and Policy

Carrying out SFRA helps ACC satisfy the requirements placed on local authorities under section 1 of the Flood Risk Management (Scotland) Act 2009 ('the Act'). Section 1 of the Act requires Local Authorities to exercise their functions with a view to reducing overall flood risk and promoting sustainable flood risk management.

By 2015, the Act requires that Flood Risk Management Plans (FRMPs) are required to be prepared for each Local Plan District in Scotland, which need be taken into account when preparing future Local Development Plans. Aberdeenshire Council is the lead authority for producing the Local Flood Risk Management Plan for the North East district. It is not anticipated that this will be complete before the adoption of the second Aberdeen Local Development Plan, which is expected to be in 2016.

3. Aims and Objectives

The primary aim of the SFRA is to guide the emerging Local Development Plan to ensure that future development is directed to areas of little or no flood risk wherever possible and does not increase flood risk elsewhere, for example, by affecting the storage or conveyance capacity of flood plains. Its main objectives are:

- To identify flood risk areas based on the Flood Risk Framework identified in Scottish Planning Policy, helping to determine the appropriate planning response to development proposals in these areas;

- To identify functional flood plain areas (even if already developed) to help ensure that development on these areas does not increase the risk of flooding elsewhere;
- Provide an evidence-based report on flooding and drainage issues to contribute to the production of the Main Issues Report and emerging LDP
- To contribute to the Monitoring Report and baseline for the Strategic Environmental Assessment.

4. Sources

This report has been prepared with reference to ‘Strategic Flood Risk Assessment- Technical Guidance to Support Development Planning’, a guidance document published by SEPA in June 2012. This guidance suggests a number of potential sources of information on flood risk which may be examined for the report. Those considered most useful for the Aberdeen City context are:

- SEPA Flood Extent Maps¹;
- SEPA National Flood Risk Assessment²;
- Previous Aberdeen City Council Biennial Reports on the prevention or mitigation of flooding in Aberdeen - the last Biennial Report was produced in 2009;
- Previous flood risk studies;
- GIS Layers including flood extents, watercourses and reservoirs, flooding incidents etc;
- Information on Flood Prevention Schemes in Aberdeen.

Note on SEPA Flood Maps

The key sources of evidence are the Indicative Flood Extent Maps produced by SEPA, which show different levels of flood risk for rivers and the coast. The current maps were produced in 2009- updated maps are expected to become available during 2014, at which point this document will be updated.

It should be noted that the Flood Maps do not show very small watercourses (those with a catchment area of less than 3km²) and do not take account of the effect of any flood defences or hydraulic structures which may be present. The maps do not show cumulative effects from different sources of flooding.

Note on National Flood Risk Assessment

The National Flood Risk Assessment (NFRA) identifies those areas of Scotland which are most vulnerable to flooding, taking into account the likelihood of flooding from all sources and the potential impact on people, property and the environment. Although it is primarily intended to inform the production of the new Flood Risk Management Plans, it also provides useful, albeit high-level, information for land use planning and the SFRA.

¹ SEPA Flood Maps Available at: http://www.sepa.org.uk/flooding/flood_extent_maps.aspx

² Further information on the NFRA is available at: http://www.sepa.org.uk/flooding/flood_risk_management/national_flood_risk_assessment.aspx

The NFRA classifies catchment units according to flood risk from 'Very Low' to 'Very High'. All units classified 'Medium' or above are designated as Potential Vulnerable Areas (PVAs). 5 units in Aberdeen City, covering most of the local authority area, are classified as PVAs. Datasheets are produced for each PVA and these provide a high-level indication of why the areas were designated as being at risk, details of the sources of flooding within it, and impacts predicted. The datasheets can be found in the Appendix at the end of this report.

As and when new or updated information becomes available, this document will be updated to reflect any changes.

5. Evidence of Flood Risk in Aberdeen

There are 6 main potential sources of flood risk: rivers (fluvial), the sea (coastal), surface water (pluvial), groundwater, drainage and sewers and infrastructure failure (e.g. reservoir or canal breaches). This report now examines the flood risk posed to the ALDP area from each of these sources.

5.1 Fluvial and Coastal

There is over 600km of watercourses (both open and culverted) in Aberdeen City (Map 1). Many of these are small watercourses which are not identified by the SEPA maps, but may still be vulnerable to localised flooding, particularly where blockages occur. It is important to consider the presence of small watercourses when assessing flood risk on individual sites.

Maps 2-4 show the areas identified as being at risk of flooding from fluvial and coastal sources according to the SEPA Flood Extent Maps. Map 2 shows the areas affected by 1% annual probability of flooding (1: 100 years), Map 3 shows a 0.5% annual probability (1: 200) and Map 4 shows a 0.1% annual probability (1: 1000).

The main areas at high flood risk in Aberdeen are along the large watercourses, including the River Dee, River Don and the Denburn and the coast and harbour-side area.

5.2 Pluvial (Surface Water) and Rising Groundwater

Pluvial flooding, or flooding due to excess surface water, occurs after periods of intense and prolonged rainfall which saturate either the natural substrate or urban drainage systems, so excess water cannot be safely drained away. Therefore, pluvial flooding is more likely to occur where the ground is naturally poorly drained or has been developed without adequate urban drainage systems in place.

SEPA has produced maps showing flood risk from surface water at a national level. This map is available from SEPA and gives some indication that areas in Aberdeen may be at risk from pluvial flooding. However, the map should be

treated with caution and it is recommended that advice is sought from SEPA with regards to pluvial flood risk on specific sites.

Flooding due to rising groundwater is also likely to occur after periods of intense and prolonged rainfall, when the water table rises above normal levels. Groundwater flooding is most likely to occur in low lying areas which are underlain by permeable rocks such as chalk, sandstone, or localised sands and gravels. Therefore, information on underlying geology may give an indication if a site is prone to groundwater flooding.³

Map 5 gives a broad indication of vulnerability to groundwater flooding. The PVA datasheets also give an indication of which catchment units may be at risk from rising groundwater; this type of flooding has the potential to affect a large part of the Aberdeen City Area.

5.3 Roads Drainage and Sewers

Roadside drains, sewers and culverts can also be the cause of flood events if they fail, become blocked or are inundated with water that exceeds their capacity. Many of the flood incident points shown on Map 6 occurred as a result of blocked drains, gullies, culverts and other small watercourses. These occurred all across the city, although 'hotspots' may be identified.

Flooding due to blocked drains is addressed by Roads Maintenance. There is also a regime for the inspection of open watercourses in place, and hecks (trash screens) are inspected on a monthly basis and before anticipated high level rainfall.

5.4 Infrastructure Failure

There is not considered to be any significant risk of flooding due to infrastructure failure in Aberdeen. Although a number of reservoirs and canals do exist in and around the urban area, there are no large dams or levees and no records of previous flooding of this type. Flooding may also occur as a result of burst water mains, however these are the responsibility of Scottish Water and it is not possible to predict these events.

See Map 7 for a map of reservoirs in Aberdeen, of which there are very few. The majority of these are located in the Deeside area.

6. Identification of Functional Floodplain Areas

Map 8 shows the flood extents for the River Dee, for a 75 year return period. This may provide an indication of the functional floodplain of the River Dee. It was not possible to obtain a similar map for the River Don, although the SEPA Flood Extent Maps provide a similar picture. Further guidance should be sought from SEPA when attempting to identify whether a site is on the functional floodplain.

³ The UK Groundwater Forum provides information about groundwater flooding. Further information can be found at www.groundwateruk.org

7. Significant Historical Flooding Events in Aberdeen

Council Committee Reports and media reports provide a useful source of information on significant flooding events experienced in Aberdeen.

- September 2009 – Weeks of solid rain in the North East resulted in heavy flooding in parts of Aberdeen, many properties affected had previously been flooded, highlighting their vulnerability.
- 25 August 2012 (see *Committee Report EPI 12 240, 6 November 2012*) - On this date, Aberdeen experienced a localised, intense rainfall event of relatively short duration. It is believed that up to 30mm fell within one hour, meaning the downpour was at least a 1 in 100 year event. This gave rise to a number of flooding incidents across the city, affecting both commercial and residential properties, as well as disrupting travel. The full Committee Report details all of the recorded flooding incidents for this day.⁴
- November 2012 – The coastal village of Footdee was engulfed in sea foam after intense storms swept Aberdeen. The foam caused a good deal of damage and nuisance, and required a large expenditure on clean up operations.

8. Existing Flood Defence Schemes

Flood Prevention Schemes currently in place or under construction in Aberdeen include:

- Glashieburn, Bridge of Don close to Lochside Drive
- Fraser Road, to the north of Hutcheon Street
- Gilcomston Burn
- West Cults Farm (private scheme)
- Jacks Brae
- Aberdeen Beach Recharge- To protect the revetments and the area around Aberdeen beach from continued erosion and failure, a programme of beach recharge took place in July and August 2006. To ensure the stability of the new beach and to protect the area from further erosion, rock t-head extensions to the present timber groynes were constructed.

⁴ Committee Report available online at: <http://committees.aberdeencity.gov.uk/mgConvert2PDF.aspx?ID=22719>

Retention Basins

Areas are currently being identified by the Council for upstream retention basins to help reduce run-off further downstream and prevent flooding in the more built up areas of the City. These areas may be safeguarded by the next Local Development Plan.

9. The Impacts of Climate Change on flood risk

It is widely anticipated that future changes in climate will lead to more intense storm events, of increasing frequency, which may have significant impacts for flooding.

The [Aberdeen Climate Change Action Plan 2002](#)⁵ contains a number of predictions for the effects of Climate Change on the North East of Scotland, using the UK Climate Projections 2002. Many of these may have implications for flooding, including:

- In winter the North East could experience up to 10% increase in rainfall in the next 20 years and by 2080 between 20–30%.
- By the 2080s, heavy winter rain intensities, that are currently experienced around once every two years, may become between 15% and 20% heavier.
- For some UK east coast locations, extreme sea levels could occur between 10 and 20 times more frequently by the 2080s than they do now, under the Medium-High Emissions scenario.
- Even accounting for natural vertical land rise in the North East (+0.7mm/yr), by the 2080s, sea level may be between 1 cm (Low Emissions scenario) and 61cm above (High Emissions scenario) the current level- potentially increasing flooding during winter and storm periods from both flooding and the sea.

The Action Plan is in the process of being updated by ACC using the latest UK Climate Projections, when this is available, this document will be updated.

10. Assessment of Site Options According to Flood Risk

The main aim of collecting the evidence in section 1 of the SFRA is to assist in directing development to areas of little or no flood risk wherever possible, referring to the Flood Risk Framework contained in Scottish Planning Policy (2010). The following assessment is for sites which were submitted through the pre-Main Issues Report Consultation and are preferred options in the Main Issues Report. Sites which are not preferred options have not been assessed.

The flood risk category into which a site falls is identified using the SEPA Flood Extent Maps:

⁵ Aberdeen Climate Change Action Plan 2002 Executive Summary can be found online at: <http://committees.aberdeency.gov.uk/mgConvert2PDF.aspx?ID=22719>

- Little or No Risk – annual flooding probability less than 0.1% (1:1000)
- Low to Medium Risk – annual flooding probability between 0.1 and 0.5% (between 1:1000 and 1:200)
- Medium to high risk – annual probability greater than 0.5% (1:200)

Table A: Preferred Options Appraisal Checklist

ID B-	Site Name	Grid Ref	Fluvial Flooding Category				Coastal Flooding Category				Ground water Y/N	Surface water Y/N	Proposed Development	1. Risk 2. Justification 3. Mitigation
			No risk	Low-Med	Med-high (built up)	Med-high (undevel)	No risk	Low-Med	Med-high (built up)	Med-high (undevel)				
1202	Craiginch es Prison		x				x						Likely mixed use	1. Little or no risk of either coastal or fluvial flooding
1310	Nigg Bay Harbour		x						x				New harbour	1. Coastal location medium to high risk coastal flooding, with some development nearby. 2. Project identified as being of national economic importance 3. An Environmental Impact Assessment will require to be carried out by the developer, with mitigation measures as appropriate
1002	Grove Nursery		x				x						Garden Centre	1. Little or no risk of either coastal or fluvial flooding.
0302	Woodend Hospital				x		x						New children's hospice	1. Medium to high risk of fluvial flooding affecting the southern part of the site. 2. Proposal is of significant social merit 3. Flood risk may be mitigated by avoiding development on the southern part of the site
	Ness Solar Farm		x				x						Solar farm	1. Little or no risk of either coastal or fluvial flooding
0105	Raiths Transport Interchange		x				x						Business and Industrial	1. Little or no risk of either coastal or fluvial flooding
0904	Woodend Farm Site 2		x				X						Residential	1. Little or no risk of either coastal or fluvial flooding
0905	Woodend Farm Site 1		x				X						Residential	1. Little or no risk of either coastal or fluvial flooding
0913	Malcolm Road (east)		x				X						Residential	1. Little or no risk of either coastal or fluvial flooding

0914	Mid Anguston		x				x							Residential	1. Little or no risk of either coastal or fluvial flooding
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Sources used or referred to during the preparation of this report:

Aberdeen City Council Reports

Climate Change Action Plan 2002
Committee Report EPI 12 240 'City Wide Flooding Issues' 6 Nov 2012
6th and 7th Flood Prevention Biennial Reports (2008/2009)

Aberdeen City Council GIS resources

Watercourses and Reservoirs
Flood Incidents
Groundwater Vulnerability

SEPA Resources

Flood Extent Maps
National Flood Risk Assessment- Potentially Vulnerable Areas

Other sources

UK Groundwater Forum www.ukgroundwater.co.uk

Useful Contacts:

Local Development Plan Team

Enterprise, Planning and Infrastructure
Aberdeen City Council
Business Hub 4, Marischal College
Broad Street
Aberdeen AB10 1AB
ldp@aberdeencity.gov.uk
01224 523325 (Grace Harrison- author)

SEPA Aberdeen Office

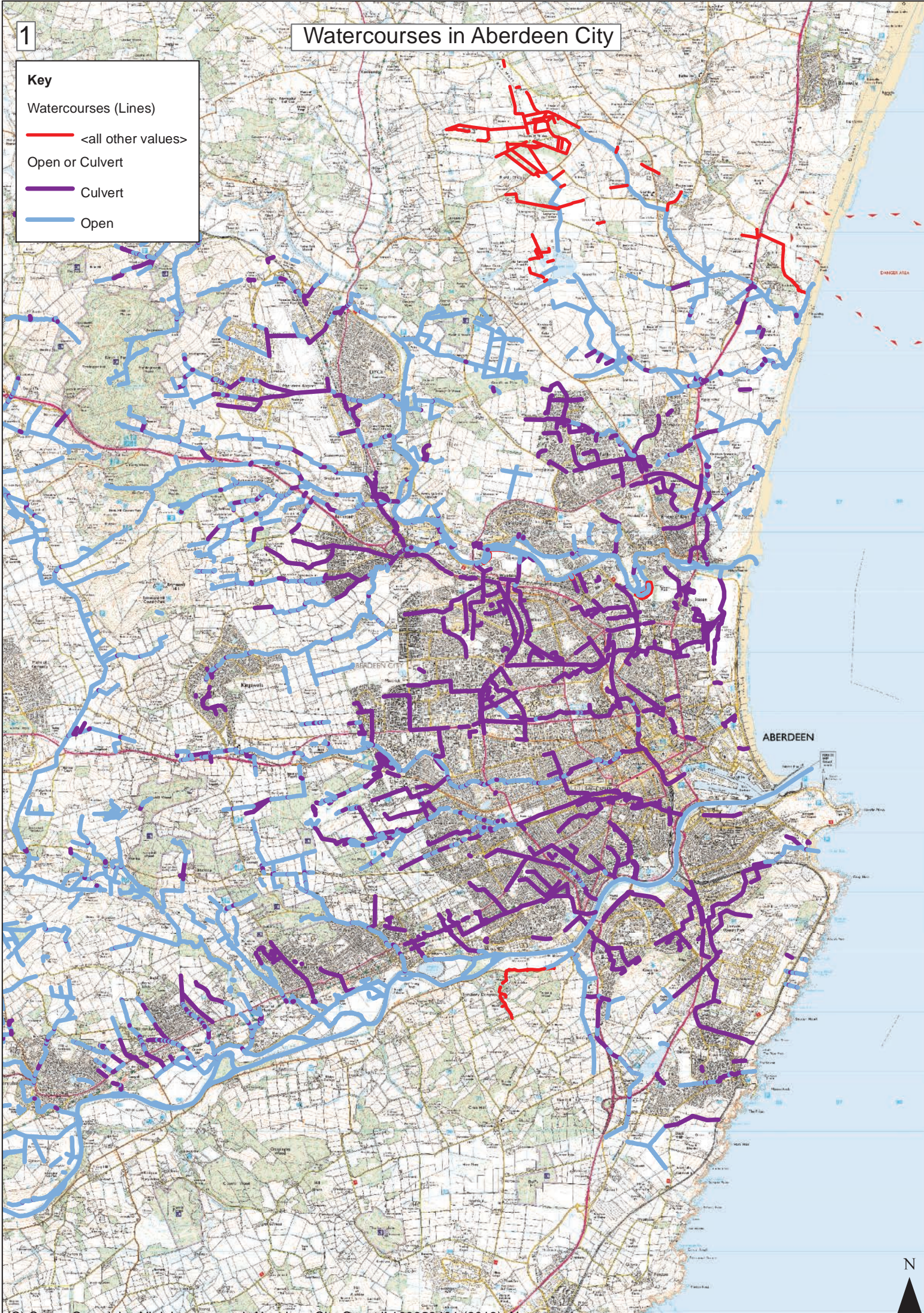
Inverdee House
Baxter Street
Torry
ABERDEEN, AB11 9QA
Tel: 01224 26662

Watercourses in Aberdeen City

Key

Watercourses (Lines)

- <all other values>
- Open or Culvert
- Culvert
- Open





ABERDEEN



River and Coastal Flood Risk - 1% Annual Probability



Key

-  Indicative flood outline based on a 1% or greater (or 1 in 100 chance) annual probability of fluvial flooding.
-  Indicative flood outline based on a 1% or greater (or 1 in 100 chance) annual probability of coastal flooding.



River and Coastal Flood Risk - 0.5% Annual Probability



Key

-  Indicative flood outline based on a 0.5% or greater (or 1 in 200 chance) annual probability of fluvial flooding.
-  Indicative flood outline based on a 0.5% or greater (or 1 in 200 chance) annual probability of coastal flooding.



River and Coastal Flood Risk - 0.1% Annual Probability

Key

-  Indicative flood outline based on a 0.1% or greater (or 1 in 1000 chance) annual probability of fluvial flooding.
-  Indicative flood outline based on a 0.1% or greater (or 1 in 1000 chance) annual probability of coastal flooding.



Groundwater Vulnerability Index

Key

Vulnerability Index

D_AQCODE

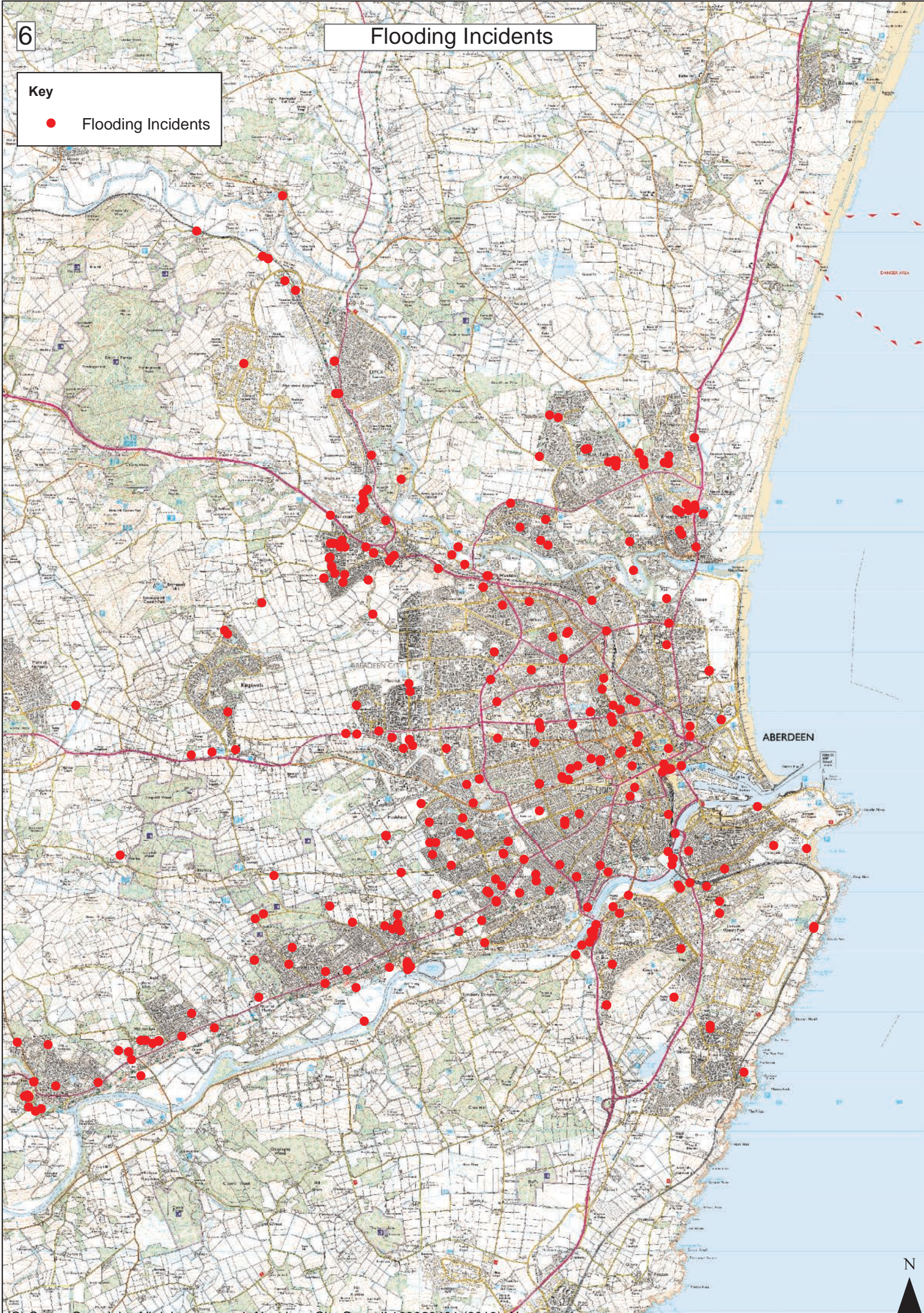
Red	H
Green	L
Yellow	M
Light Green	N
Grey	U



Flooding Incidents


Key

- Flooding Incidents



Reservoirs


Key

 Reservoirs



River Dee Flood Extent

Key

 75 Return Flood Period



Potentially Vulnerable Area Datasheet

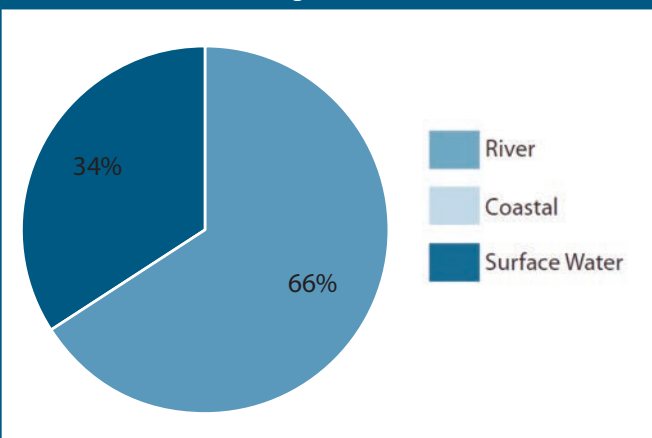
PVA:	Local Plan District:	Main River Catchment:	Local Authority:
06/15	6 – North East	River Don Aberdeen North Coastal	Aberdeen City Aberdeenshire

Summary of Main Impacts

Assessment of future flood risk and past events shows that River Don presents: impact to a large number of residential properties; impact to some commercial properties; impact to major transport links; limited impact to agriculture and impact to sensitive designated cultural sites, with infrequent reports of flooding in the area.

Estimated Weighted Annual Average Damages	£3,210,000 – £3,800,000
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Known Source of Flooding



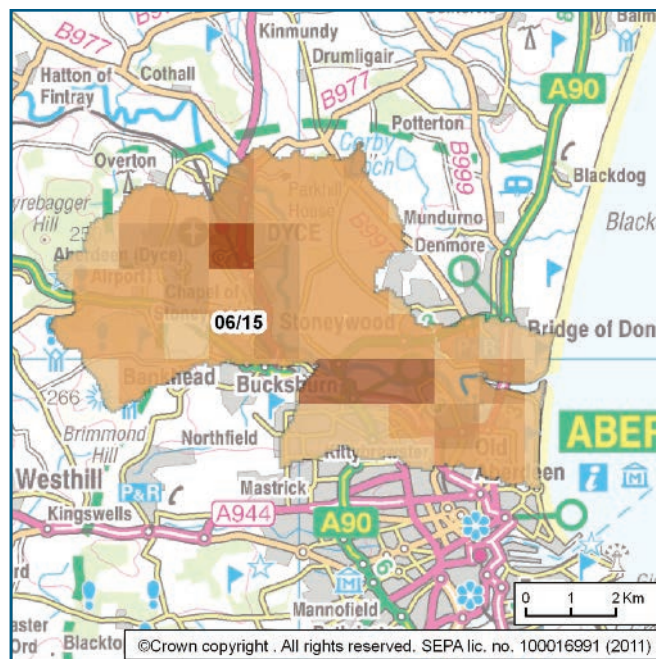
Groundwater Flooding	Low to moderate contribution within part of the catchment.
Impact of Climate Change	Low increase in rainfall with potential for a larger increase in run-off.

Properties at Flood Risk in PVA

Type	Number	Proportion of All Properties in PVA
Residential	475	2%
Non-residential	55	4%

Towns and Villages with Properties at Risk

50+	Aberdeen, Danestone
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PVA Characteristics

Total Area	46.12km ²	
Land cover within the PVA	Urban	50%
	Agriculture	40%
	Forestry	10%
Includes Flood Defence(s)	No	
Catchment Hydrology	<ul style="list-style-type: none"> • Long peak flood flow response times; • Very high catchment flood storage and attenuation capacity; • Very low potential for underestimation of design flood magnitude; • Very low erosion hazard potential of flood flows. 	
Catchment Morphology	<ul style="list-style-type: none"> • Predominance of meandering/braided channel types; • Predominance of natural channels and/or unprotected floodplains; • Very high density of hydraulic structures; • Very high potential for increased flood risk due to upstream morphological pressures. 	

February 2012. The information in this datasheet is based on the National Flood Risk Assessment. Please read the datasheet in conjunction with the Explanatory Text in the following pages.

Potentially Vulnerable Area Datasheet

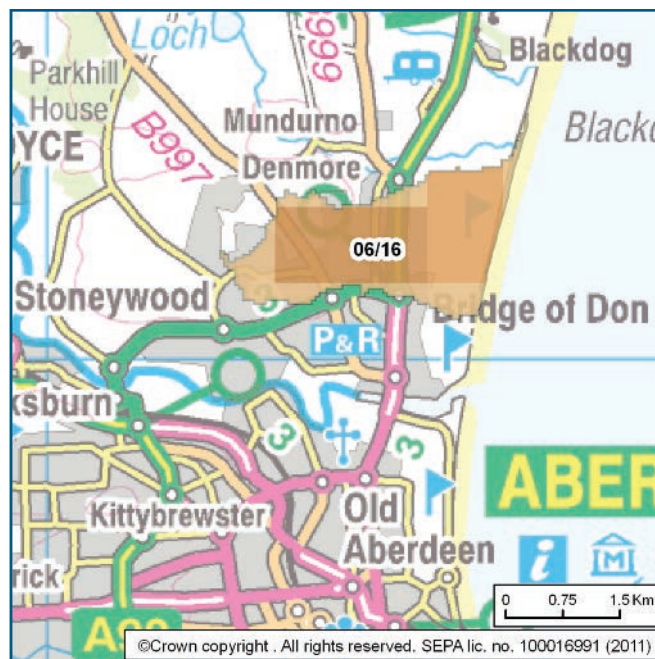
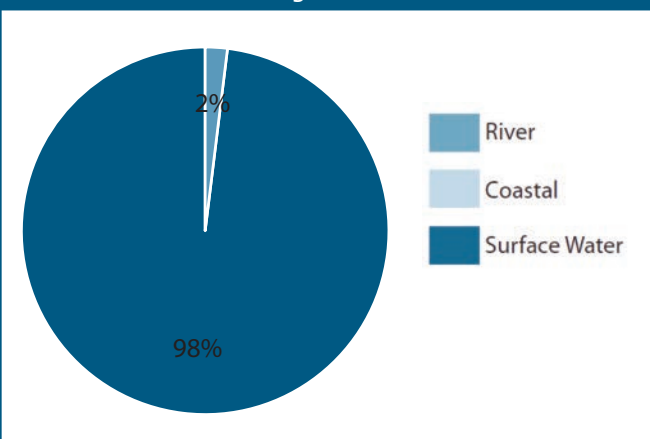
PVA:	Local Plan District:	Main River Catchment:	Local Authority:
06/16	6 – North East	Buchan Coastal	Aberdeen City

Summary of Main Impacts

Recent reports of flooding within the area. Existing defences on Glashieburn offer partial protection to flooding impacts.

Estimated Weighted Annual Average Damages	£60,000 – £90,000
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Known Source of Flooding



Groundwater Flooding	Very low to low contribution within part of the catchment.
Impact of Climate Change	Low increase in rainfall with potential for a larger increase in run-off.

Properties at Flood Risk in PVA

Type	Number	Proportion of All Properties in PVA
Residential	7	1%
Non-residential	2	2%

Towns and Villages with Properties at Risk

50+	
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PVA Characteristics

Total Area	4.74km ²	
Land cover within the PVA	Urban	70%
	Agriculture	30%
	Forestry	0%
Includes Flood Defence(s)	Yes	
Catchment Hydrology	<ul style="list-style-type: none"> Insufficient information available for categorisation. See Explanatory Text for data used. 	
Catchment Morphology	<ul style="list-style-type: none"> Insufficient information available for categorisation. See Explanatory Text for data used. 	

February 2012. The information in this datasheet is based on the National Flood Risk Assessment. Please read the datasheet in conjunction with the Explanatory Text in the following pages.

Potentially Vulnerable Area Datasheet

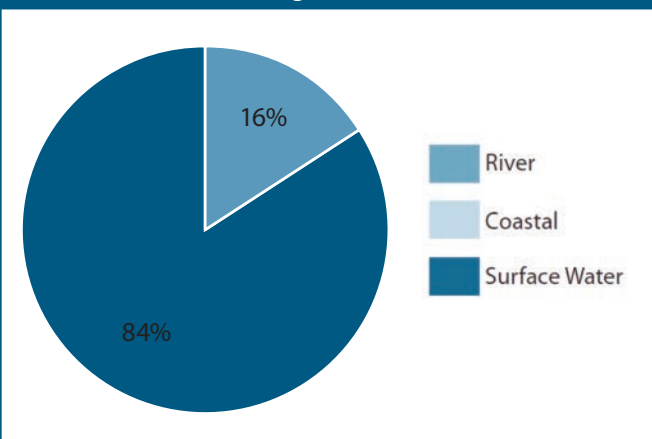
PVA:	Local Plan District:	Main River Catchment:	Local Authority:
06/17	6 – North East	River Dee (Grampian)	Aberdeen City Aberdeenshire

Summary of Main Impacts

Assessment of future flood risk and past events shows recent reports of flooding in the area.

Estimated Weighted Annual Average Damages	£270,000 – £330,000
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Known Source of Flooding



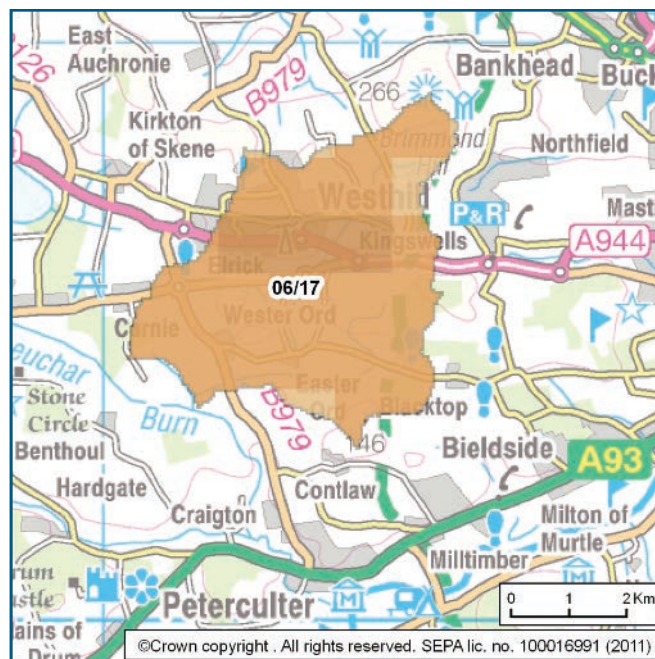
Groundwater Flooding	Low to moderate contribution within part of the catchment.
Impact of Climate Change	Low increase in rainfall with potential for a larger increase in run-off.

Properties at Flood Risk in PVA

Type	Number	Proportion of All Properties in PVA
Residential	42	2%
Non-residential	4	2%

Towns and Villages with Properties at Risk

50+	
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PVA Characteristics

Total Area	19.74km ²	
Land cover within the PVA	Urban	11%
	Agriculture	80%
	Forestry	9%
Includes Flood Defence(s)	No	
Catchment Hydrology	<ul style="list-style-type: none"> Moderate peak flood flow response times; Moderate catchment flood storage and attenuation capacity; Potential for moderate underestimation of design flood magnitude; Moderate erosion hazard potential of flood flows. 	
Catchment Morphology	<ul style="list-style-type: none"> Predominance of bedrock/plane-bed channel types or lochs; Predominance of realigned channels and/or protected floodplains; Very low density of hydraulic structures; Very low potential for increased flood risk due to upstream morphological pressures. 	

February 2012. The information in this datasheet is based on the National Flood Risk Assessment. Please read the datasheet in conjunction with the Explanatory Text in the following pages.

Potentially Vulnerable Area Datasheet

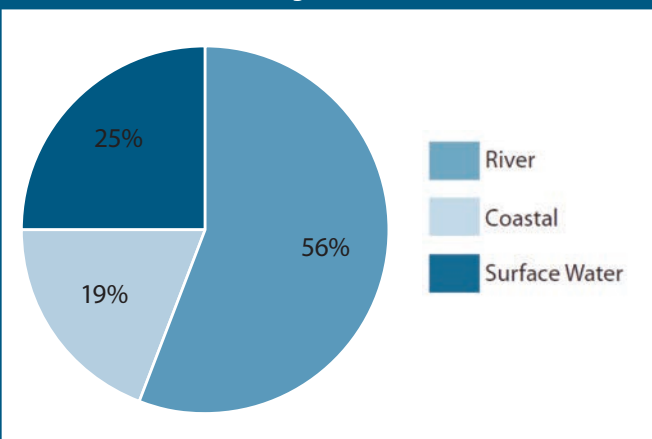
PVA:	Local Plan District:	Main River Catchment:	Local Authority:
06/18	6 – North East	River Dee (Grampian) Aberdeen South Coastal	Aberdeen City Aberdeenshire

Summary of Main Impacts

Assessment of future flood risk and past events shows that several burns present: impact to a large number of residential properties; impact to a large number of commercial properties; limited impact to transport links; limited impact to agriculture; impact to sensitive environmental designation and impact to extensive area of sensitive designated cultural sites, with infrequent reports of flooding in the area. Existing defences on Gilcomston Burn offer partial protection to some of these impacts.

Estimated Weighted Annual Average Damages	£7,320,000 – £10,420,000
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Known Source of Flooding



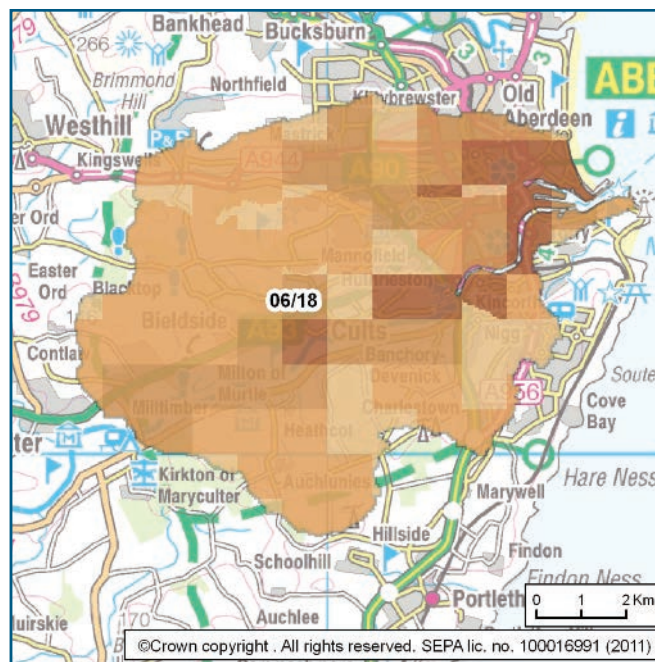
Groundwater Flooding	Moderate to high contribution within part of the catchment.
Impact of Climate Change	Low increase in rainfall with potential for a larger increase in run-off. Coastline is not vulnerable to the impacts of climate change.

Properties at Flood Risk in PVA

Type	Number	Proportion of All Properties in PVA
Residential	641	2%
Non-residential	278	7%

Towns and Villages with Properties at Risk

50+	Aberdeen, Cults, Kincorth
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PVA Characteristics	
Total Area	74.51km ²
Land cover within the PVA	Urban 45%
	Agriculture 44%
	Forestry 11%
Includes Flood Defence(s)	Yes
Catchment Hydrology	<ul style="list-style-type: none"> • Short to moderate peak flood flow response times; • Low catchment flood storage and attenuation capacity; • Potential for high underestimation of design flood magnitude; • High erosion hazard potential of flood flows.
Catchment Morphology	<ul style="list-style-type: none"> • Predominance of bedrock/plane-bed channel types or lochs; • Predominance of realigned channels and/or protected floodplains; • Very low density of hydraulic structures; • Very low potential for increased flood risk due to upstream morphological pressures.

February 2012. The information in this datasheet is based on the National Flood Risk Assessment. Please read the datasheet in conjunction with the Explanatory Text in the following pages.

Potentially Vulnerable Area Datasheet

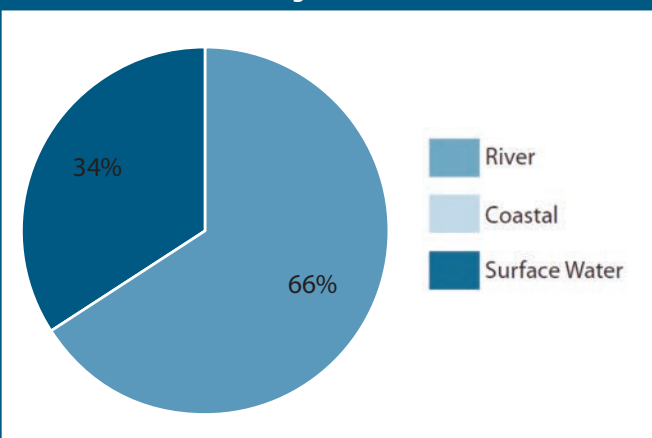
PVA:	Local Plan District:	Main River Catchment:	Local Authority:
06/19	6 – North East	River Dee (Grampian)	Aberdeen City Aberdeenshire

Summary of Main Impacts

Assessment of future flood risk and past events shows that Culter Burn/Gormack Burn presents: impact to some residential properties, with past reports of flooding in the area.

Estimated Weighted Annual Average Damages	£1,020,000 – £1,050,000
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Known Source of Flooding



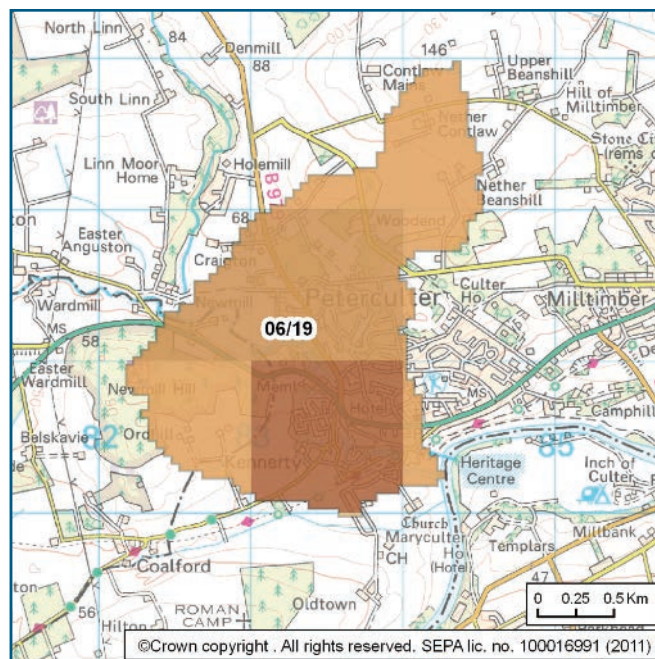
Groundwater Flooding	Low to moderate contribution within part of the catchment.
Impact of Climate Change	Low increase in rainfall with potential for a larger increase in run-off.

Properties at Flood Risk in PVA

Type	Number	Proportion of All Properties in PVA
Residential	184	12%
Non-residential	2	3%

Towns and Villages with Properties at Risk

50+	Peterculter
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PVA Characteristics		
Total Area	3.7km ²	
Land cover within the PVA	Urban	20%
	Agriculture	67%
	Forestry	13%
Includes Flood Defence(s)	No	
Catchment Hydrology	<ul style="list-style-type: none"> Moderate to long peak flood flow response times; High catchment flood storage and attenuation capacity; Potential for low to moderate underestimation of design flood magnitude; Low erosion hazard potential of flood flows. 	
Catchment Morphology	<ul style="list-style-type: none"> High proportion of meandering/braided channel types; High proportion of natural channels and/or unprotected floodplains; High density of hydraulic structures; High potential for increased flood risk due to upstream morphological pressures. 	

February 2012. The information in this datasheet is based on the National Flood Risk Assessment. Please read the datasheet in conjunction with the Explanatory Text in the following pages.