



Flood Prevention Update and Local Flood Risk Management Strategy

Report of Corporate Management Team

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Purpose of the Report

- 1 To provide an update on the work undertaken by the Council working with partners and local communities in relation to flood prevention works and improved community flood resilience.
- 2 To seek approval to enter into a public consultation on a Local Flood Risk Management Strategy (LFRMS).

Background

- 3 In 2012, County Durham experienced exceptional rainfall which resulted in multiple severe flood events countywide. These events flooded over 500 properties and impacted on many communities. Many key parts of the highway network were flooded and became impassable. Roads had to be closed which hindered the emergency response and caused widespread disruption to the local economy. Please see **Appendix 2** to this report that provides examples of highway and property flooding in various locations across the county.
- 4 Further flooding events have been experienced every year since this time although on a lesser scale than 2012. Since the beginning of December 2015 there have been a number of flooding events which have had an impact across the County:
 - Storm Desmond – 5th/6th December 2015;
 - Storm Eva – 24th December 2015;
 - Storm Frank – 5th January 2016; and
 - Storm Gertrude – 29th January 2016.
- 5 The Council has received 30 confirmed reports of internal property flooding and 151 service requests for flood investigations since 1 December 2015. These flooding events caused significant damage to highway infrastructure. Please see **Appendix 3**: Flood Damage December 2015 to January 2016.
- 6 Durham County Council (DCC) is the Lead Local Flood Authority (LLFA) for County Durham under the Flood and Water Management Act 2010 (FWMA 2010).

- 7 The key responsibilities of the LLFA are:
- Prepare and maintain a strategy for local flood risk management in their areas, coordinating views and activity with other local bodies and communities through public consultation and scrutiny, and delivery planning;
 - Maintain a register of assets – these are physical features that have a significant effect on flooding in their area;
 - Investigate significant local flooding incidents and publish the results of such investigations;
 - Issue consents for altering, removing or replacing certain structures or features on ordinary watercourses; and
 - Play a lead role in emergency planning and recovery after a flood event.
- 8 It is predicted that, as a result of climate change, the frequency and severity of flooding events will continue to increase over time. Cabinet last received a flooding update report in September 2013 and, as considerable work has been undertaken since then, it is timely that an update is provided. The report is in two parts: the first covers flood prevention works (both capital and revenue), the second the work in development of a Local Flood Risk Management Strategy which the Council is required to produce.

Flood Prevention Update

Durham Strategic Flood Prevention Group

- 9 As the LLFA, the Council works closely with partners to deliver flood prevention schemes in County Durham.
- 10 The Council hosts and Chairs the Durham Strategic Flood Prevention Group that includes the following parties:
- DCC (representatives from Drainage & Coastal Protection Team, Planning, Civil Contingencies Unit and Cllr Tracie Smith [DCC Member for the Northumbria Regional Flood & Coastal Committee]);
 - Environment Agency (EA);
 - Northumbrian Water Limited (NWL);
 - County Durham Fire & Rescue Service; and
 - Durham Wildlife Trust.
- 11 The objectives of the group are to:
- Promote flood prevention schemes and prioritise schemes for funding
 - Monitor the delivery of flood prevention schemes;
 - Ensure that flood prevention is fully considered as part of development plans;
 - Liaise on the development of relevant flood prevention strategies and plans;
 - Promote collaborative working between the partner organisations; and
 - Provide a forum for sharing information and best practice on flood prevention.

- 12 Clearly, there is an important role for the Council in not only leading this group but also managing the highway drainage assets in the most effective way. The Department for Transport's (DfT) Highways Maintenance Efficiency Programme (HMEP) made 12 recommendations in relation to managing highway drainage assets. **Appendix 4** to this report sets out the 12 recommendations and a self-assessment of how the Council meets those requirements.

Flood Investigations

- 13 Since the flooding events of 2012, there have been over 1,300 service requests for flood investigations which are summarised as follows:

Flooding Source	Number of Flood Investigations
Sewer	87
Highway	328
Overland	240
River/Water Course	201
Other	536
Total	1,392

- 14 The above includes 151 service requests since 1 December 2015. The investigations have identified works of varying degrees to remove or mitigate the risk of further flooding to both highway and property.

Revenue Works

- 15 The Council has provided additional funding to the Drainage & Coastal Protection Team to undertake inspections and maintenance of highway assets. The funding is summarised as follows:

Year	Base Budget £'000	Additional Funding £'000	Total Council Funding £'000s
2011/12	405	0	405
2012/13	405	0	405
2013/14	405	250	655
2014/15	405	250	655
2015/16	405	250	655
2016/17	405	250	655

- 16 The additional funding has been provided from a combination of Corporate Reserves and Neighbourhood Services Cash Limit Reserve. The Drainage & Coastal Protection Team has mitigated flood risk at approximately 75% of reported flooding incidents to date using this extra funding.
- 17 The funding to date has been targeted on a reactive basis where we have received reports of flooding associated with the following Council drainage assets:

- Piped drains;
- Highway gullies; and
- Highway ditches.

- 18 Please see **Appendix 5** - Examples of Blocked Drainage Assets.
- 19 Typically, the investigations identified that a significant number of piped drainage systems were almost 100% blocked with silt, tree roots and other materials. The additional funding was used to fully investigate the piped systems using CCTV technology and complete repairs which brought the systems back into 100% operation.
- 20 The works have also significantly improved the resilience of the principal highway network to flooding which helps keep traffic moving and supports the local economy. Long-standing flooding issues have been rectified on the following principal roads Countywide:
- A691 - Sniperley Park to Lanchester;
 - A167 - Chester le Street;
 - A167 - Whitesmocks;
 - A167 - Sunderland Bridge;
 - A167 - Ferryhill;
 - A177 - Durham;
 - A1086 - Blackhall;
 - A692 - Dipton;
 - A689 - Howden;
 - A688 - New Coundon;
 - A688 - Bowburn;
 - A688 - Bishop Auckland;
 - A689 - Howl John Farm;
 - A689 - Wolsingham;
 - A690 - Willington; and
 - A67 - Gainford.
- 21 A programme of ditch restoration has been undertaken and approximately 40 kms of highway ditches Countywide have been improved to reduce flood risk.
- 22 Overall it is estimated that the works have protected 129 properties from flooding. It should be noted that the economic cost of property flooding is estimated at £30,000 per event so the benefit assuming a one in ten year flood risk is £3.87m over ten years.
- 23 Going forward the revenue funding is being used to undertake reactive inspections and maintenance on the following principal roads:
- A181 - Silent Bank;
 - A68 - Witton le Wear;
 - A689 - Frosterley; and
 - A690 - Crook.
- 24 Further drainage assets in high risk areas are expected to require similar reactive inspections and maintenance as the assets age and/or become blocked by silt, tree roots and debris over time so this work is far from complete.
- 25 Once the reactive inspections and maintenance are complete in high risk areas there will be a shift to preventative inspections and maintenance in high risk areas. This will involve:

- Ditching works;
 - Clearing of culvert inlets and outlets;
 - Maintenance of headwalls;
 - CCTV inspections; and
 - De-silting of assets.
- 26 A preventative regime will also help prevent properties from being flooded and help ensure that the highway network is resilient to flooding and stays open for the benefit of the local economy.

Capital Works

- 27 The Council has provided capital funding to the Drainage & Coastal Protection Team to undertake flood prevention and coastal protection schemes and funding has also been secured from the EA. Overall it is estimated that this has protected 797 properties since 2011/12. The funding is summarised as follows:

Year	Council Funding £'000s	EA Funding £'000s	Total Funding £'000s	Number of Schemes	Number of properties protected
2011/12	1,000	60	1,060	41	55
2012/13	800	295	1,095	40	186
2013/14	750	-	750	61	265
2014/15	2,115	1,045	3,160	45	80
2015/16	2,078	1,639	3,717	34	117
2016/17	1,050	-	1,050	30	94
Total	7,793	3,039	10,832	251	797

- 28 Major schemes that have been delivered to date with EA contribution are shown below:

Location	Scheme	Council Funding £'000s	EA Funding £'000s	Total Funding £'000s	Number of properties protected
Waldrige, CLS	Flood fence	-	100	100	21
West Pelton, CLS	Flood fence	-	50	50	10
Lumley Crescent, CLS	Flood fence	-	40	40	3
Hopgarth Court, CLS	Drainage improvements	-	20	20	2
Vivian Crescent, CLS	Highway re-profile	-	20	20	2
Oakenshaw	Major drainage scheme	-	90	90	13
Lanchester	Investigation and design	-	90	90	0
Witton Gilbert	Major drainage scheme	235	487	722	50
Brasside	Investigation and design	20	-	20	5

Seaham North Pier	Emergency investigation works	-	60	60	0
Seaham North Pier	Detailed Structural Study	-	295	295	0
Seaham North Pier	Design and construction	2,078	1,507	3,585	2
Etherley lane Bishop Auckland	Major drainage scheme	80	117	197	8
St Johns Chappel	Major drainage scheme	24	163	187	6
Total		2457	3,039	5,496	122

- 29 Please see **Appendix 6: Completed Flood Prevention Schemes.**
- 30 A pipeline of future major schemes with EA contribution is being developed for inclusion in the EA's 6 year programme and the latest draft is summarised as follows:

Scheme	Financial Year	Council Funding	EA Funding	Total Funding £'000s
Greta Bridge	2016/17	-	40	40
Lanchester	2016/17	200	600	800
New Brancepeth & Ushaw Moor	2016/17	-	48	48
Shotley Bridge	2019/20	-	86	86
Dene Crescent	2017/18	-	46	46
Pelton	2017/18	-	32	32
Craigland Villas	2018/19	-	46	46
Dipton	2018/19	-	37	37
Castlefields Bournmoor	2019/20	6	30	36
Cherry Bank	2020/21	1	5	5
Dunelm Walk, Leadgate	2019/20	12	20	32
Hardwick Rd, Sedgefield	2019/20	55	106	161
Hillmeads, Nettlesworth	2019/20	10	85	95
North West Durham	2019/20	-	7	7
Kingfisher Close, Esh Winning	2020/21	88	67	155
Total		372	1,255	1,626

- 31 The Drainage & Coastal Protection Team has also started work on identifying schemes for years 2021-2027.
- 32 Using the Surface Water Flood Maps developed by the EA, we have identified approximately 10,000 properties at risk from a 1:100 year event. It is estimated that it would cost approximately £96m to mitigate flood risk in all locations. However, it is acknowledged by the EA that their flood maps are based upon the topography of the land and are not refined to take into account existing drainage systems, watercourses and other aspects that may potentially remove many of these areas from a 1 in 100 year flood risk.

- 33 Therefore the Drainage & Coastal Protection Team go through a process to refine the EA flood maps with the benefit of local knowledge and to prioritise areas of greatest need in terms of mitigation measures to prevent flooding.
- 34 The Drainage & Coastal Protection Team is now working through the flood maps to identify viable schemes that may be submitted to the EA for consideration.

Flood Damage – Additional Funding

- 35 The floods in recent years have resulted in significant extra costs in terms of the operational response and repairs to damaged infrastructure.
- 36 The Government operates the Bellwin scheme to provide emergency financial assistance to Councils above a threshold based on the size of the Council. Unfortunately due to a combination of the high threshold and the eligibility criteria which are very narrow the Council has not qualified for any funding from the Bellwin scheme to date.
- 37 The Council has however recently secured £1.1 million of funding from the Department for Transport to fund repairs to the highway following flood damage in December 2015 and January 2016.
- 38 The Council has also provided additional funding from reserves to help fund these costs:

Financial Year	Revenue Funding £'000s	Capital Funding £'000s	Total Funding £'000s
2012/13	845	975	1,820
2013/14	442	-	442
2014/15	215	-	215
2015/16	890	750	1,640
2016/17	-	-	-
Total	2,392	1,725	4,117

- 39 The flood damage suffered in December 2015 and January 2016 is shown in Appendix 3 – Flood Damage December 2015 to January 2016.

Community Resilience

- 40 Notwithstanding all of the preventative work undertaken, this does not remove the risk of flooding. Therefore, the Council has been working with residents and partners to improve community resilience, and allow for the faster deployment of local resources, including sandbags as well as care for the more vulnerable.
- 41 The Council's Civil Contingencies Unit has been developing local plans and preparations in relation to severe weather including flooding. The first four community resilience plans have now been completed in Lanchester, Dilton, Chester le Street Newfield and Town Ends and Chester le Street Town Centre.
- 42 Community resilience events have also been held in March 2016 in five rapid response areas which are detailed below:

- Bishop Auckland;
 - Wolsingham;
 - Chester le Street;
 - Murton; and
 - Stanhope.
- 43 These are multi-agency events with attendance from the Police, Fire & Rescue Service, EA, DCC's Civil Contingencies Unit and Drainage & Coastal Protection Team along with contractors/suppliers of property protection products.
- 44 There are 224 uniformed youth (air cadets, police cadets, young firefighters and scouts) currently undertaking Duke of Cornwall Community Safety Award. They are hoping to be presented with their awards later this year.
- 45 The government has introduced two schemes to assist residents who have suffered internal property flooding from Storm Desmond and Storm Eva and these are being administered by the Drainage & Coastal Protection Team. The Communities and Business Recovery Scheme is providing £500 to every household flooded and £2,500 for flooded businesses. This is intended to help with recovery costs, such as temporary accommodation. The Property Resilience Grant Scheme is providing up to £5,000 per property to improve resilience to future flooding events. This applies to both households and businesses. Currently, we are aware of 24 households and 2 businesses that qualify for the scheme.

Local Flood Risk Management Strategy (LFRMS)

- 46 A key requirement of the FWMA 2010 is for LLFAs to develop and publish a LFRMS. The aims of the LFRMS are that all relevant partners work together to:
- i) Understand flood risk in County Durham;
 - ii) Mitigate flood risk in County Durham; and
 - iii) Build resilience to flood risk in County Durham.
- 47 It is a high level document, incorporating the main aims and principles. The proposed LFRMS for County Durham is shown in **Appendix 7**. The FWMA 2010 requires that there is a public consultation on the LFRMS.
- 48 It is proposed that public consultation be undertaken which will all partners, Area Action Partnerships, Town and Parish Councils and residents. This would last for a period of 3 months and include a web-page set up on the Council website.
- 49 It is proposed that the Interim Corporate Director, Neighbourhood Services in consultation with the Cabinet Portfolio Holder for Neighbourhoods and Local Partnerships give consideration of the outcome of the consultation and have delegated authority to finalise and publish strategy.

Recommendations and Reasons

50 That Cabinet:

- i) Notes the considerable work being undertaken by the Council and partners in relation to flood prevention and improved community resilience.
- ii) Approves public consultation on the Local Flood Risk Management Strategy, and delegates the Interim Corporate Director, Neighbourhoods in consultation with the Cabinet Portfolio Holder for Neighbourhoods and Local Partnerships to finalise and publish the report after giving consideration to all feedback received.

Background Papers

- Flood and Water Management Act 2010 (FWMA 2010)
- Cabinet Report : Flooding Update dated 11 September 2013

Appendices

- Appendix 1: Implications
- Appendix 2: Examples of Highway Flooding
- Appendix 3: Flood Damage December 2015 to January 2016
- Appendix 4: HMEP - Managing Drainage Assets Guidance
- Appendix 5: Examples of Blocked Drainage Assets
- Appendix 6: Completed Flood Prevention Schemes
- Appendix 7: Local Flood Risk Management Strategy

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Appendix 1: Implications

Finance

The report details Council funding for:

- Revenue Works;
- Capital Works; and
- Flood Damage.

Staffing

None.

Risk

The LFRMS provides a strategy for managing risk.

Equality and Diversity / Public Sector Equality Duty

None.

Accommodation

None.

Crime and Disorder

None.

Human Rights

None.

Consultation

None.

Procurement

The Council delivers flood prevention schemes through its in-house contractor, Highway Services, and its supply chain of competitively procured sub-contractors.

Disability Issues

None.

Legal Implications

The Council has a statutory duty under the Flood and Water Management Act 2010 to investigate flooding events and recommend mitigation measures.

The Council has a statutory duty under the Highways Act 1980 to maintain the adopted highway.

The Council has a statutory duty under riparian law to maintain ordinary watercourses where it owns the adjacent land.

Appendix 2: Examples of Highway Flooding

Witton Gilbert (date: 28/12/2012)



Chester le Street (date: 28/06/2012)



Oakenshaw (date: 28/12/2012)



Waldrige (date: 28/12/2012)



A67-Gainford (date: 22/10/2013)



A68-West Auckland (date: 22/10/2013)



A688-St Helens Bypass (date: 28/11/2012)



A688-St Helens Bypass (date: 25/11/2012)



East Headleyhope (date: 18/05/2013)



Front Street, Lanchester (date: 28/06/2012)



Shadforth (date: 18/05/2013)



Tanfield Lea Industrial Estate (date: 18/05/2013)



Unc. Road-Witton Lido (date: 28/06/2012)



Appendix 3: Flood Damage December 2015 to January 2016

Storm Desmond – 5th and 6th December 2015

Storm Desmond was the Met Office's fourth named storm of the season, and brought severe gales and heavy rainfall to southern Scotland, the north of England, Wales and Northern Ireland when it hit on 5th and 6th December 2015.

Rainfall in this storm broke all previous UK records with the Met Office saying Honister in Cumbria received 341.4 mm (13.4 in) of rain in the 24-hours between 4 and 5 December.

During the event, operational teams across the service were deployed countywide to deal with the consequences of the heavy rainfall dealing with flooded properties, highways, buildings and structures. We have received 30 confirmed reports of internal property flooding to date mainly in the west of the county.

Below are some photographs illustrating the main damage caused by the storm.

Stanhope Footbridge - Washed away



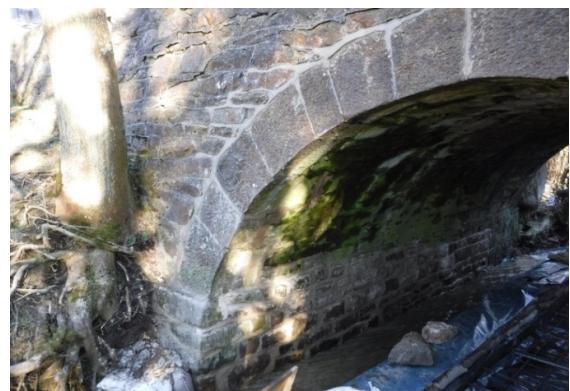
Frosterley Road Bridge - Scouring



Frosterley Kenneth's Bridge - Abutment/headwall damage and loss of rock armour



Byerley House Bridge - Arch barrel/abutment washout



Ettersgill - Landslip



B6306 Edmonbyers - Landslip



Storm Eva – 24th December 2015

Gales and torrential downpours battered the North East on the lead up to Christmas, bringing up to four inches of rain to already-soaked land - and new risks of flooding.

A fresh band of stormy weather hit the area on Christmas Eve and continued through to Boxing Day.

The photograph below illustrates the effects of the storm:



Storm Frank – 5th and 6th January 2016

Stormy weather returned to the North East on 5th and 6th January as the region caught the tail end of Storm Frank.

Gales of up to 55 mph, coupled with torrential downpours brought as much as 60 mm of rain, piling more misery on flood-hit regions of the north.

Operational teams across the service were deployed countywide to deal with the 3rd storm event within a month.

The heavy rain caused a further landslip in Weardale which closed the C75 from Frosterley to Stanhope. This key route is expected to be closed for several months as major structural works are required to repair the landslip.

Below are some photographs illustrating the major areas affected by this storm:

C75 Frosterley to Stanhope Landslip



Appendix 4: HMEP - Managing Drainage Assets Guidance

Recommendation	Response
<p>1. Effective use of limited budgets</p>	<p>Capital drainage schemes are progressed after being assessed on a priority system. This ensures the most important and cost effective schemes are done first and time, effort and resources are not wasted on lesser schemes.</p> <p>Applications are made to the Environment Agency for funding towards schemes either from the Flood and Coastal Erosion Risk Management (FCERM) Grant or from the Local Levy Grant. All schemes are subject to approval by cost benefit analysis.</p> <p>Also, where applicable the utility companies are approached to repair damages caused by their operations to drainage assets. NWL are approached for financial contributions when proposed schemes provide benefit to their assets.</p> <p>Gully cleansing frequencies have been reviewed and a computerised route optimisation exercise has increased the efficiency of the gully cleansing. Liaison between the highways teams and the specialist Drainage & Coastal Protection Team has improved with a high priority being given to identifying and resolving repeat flood areas.</p> <p>Introduction of electronic recording of scheduled and reactive gully cleansing.</p> <p>The Drainage & Coastal Protection Team attends the Durham Strategic Flood Group and has close working relationships with the Environment Agency and Northumbrian Water. This is to ensure that a collaborated approach to asset management is in place to maximise the use of resources, wherever possible.</p> <p>The handling of public reports of drainage issues has been improved by the introduction of an operational hub.</p> <p>Funding allocated to highway drainage and gully cleansing was temporarily increased to deal with a back-log of problems. Although funding has now returned to former levels, significant improvements have been</p>

	<p>maintained.</p>
2. Understanding evolving duties and responsibilities	<p>In the lead up to the introduction of the Flood and Water Management Act, DCC set about establishing a dedicated in-house team (the Drainage & Coastal Protection Team) whose duty is to investigate all significant flooding including that on the highway network.</p> <p>Where the Drainage & Coastal Protection Team find problems that have been caused by private individuals advice is given to land owners which may include recommendation of works and introduction to appropriately skilled contractors. Also, liaison, ,consultation and advice is sought from the legal section to determine the best course of action to pursue in serving a legal notice to enforce action.</p>
3. Selection of highway drainage asset survey equipment	<p>The Drainage & Coastal Protection Team regularly evaluates and, if appropriate, purchases new technology and improved equipment for survey, inspection, rehabilitation and cleansing of drainage and watercourses.</p> <p>Similarly, operational improvements have been implemented. For example, gulley motor tracking for effective operational delivery.</p>
4. Involvement of colleagues in selecting technology	<p>The GIS team is involved in developing layers and integrating EA and NWL data into DCC's GIS system.</p> <p>High quality surveying equipment is used for drainage surveys i.e. CCTV drain inspection equipment with built in locating sound. Man entry equipment including winches, harnesses, gas detectors and breathing apparatus.</p> <p>External drainage service providers have specialist equipment that is deployed in drainage investigations and surveys. For example, robotic cutting and root removal equipment, high pressure 7000psi cleansing equipment. Large capacity Jet and Vacuumation tankers. Drain lining and rehabilitation capability.</p>
5. Data integration	<p>Where CCTV surveys have been carried out, these have been recorded and there is a store of DVDs. Systems are in place to have these stored on a central server for ease of access.</p> <p>Also, all inspection reports are converted to pdf and stored on a secure server.</p>

	<p>There is co-ordinated effort between the Drainage & Coastal Protection Team and the highway maintenance section for the Highway Inspectors and gully motor crews to pass on information regarding known flooding hot spots and flooding locations that require more than clearance of blocked road gullies. Also, when significant rainfall events happen, the Highway Superintendents pass on relevant information to the Drainage & Coastal Protection Team to inspect. There is feed back to the highway section from the Drainage & Coastal Protection Team on what issues have been found, what works are required and what if any amendments to the maintenance regime need to be made.</p> <p>The Drainage & Coastal Protection Team work with highway design teams to ensure schemes in known flood areas have built in flood resilience to ensure effective operation during extreme events (e.g. Sunderland Bridge Roundabout flood fence to mitigate future flood risk to the highway and local properties).</p>
6. Data use	<p>The Drainage & Coastal Protection Team implements investigations under section 19 of the FWMA 2010. As part of the investigations, all highway drainage assets that are investigated are recorded on to GIS. This information typically includes pipe depth and size, pipe type, culvert construction, discharge points etc.</p> <p>The Drainage & Coastal Protection Team also record inlet/outlet headwalls, record their condition and location and store the information on a GIS database. Members of the Drainage & Coastal Protection Team have received accredited training in condition assessment using the EA's Condition Assessment Manual to ensure consistency in approach in determining the overall condition of a drainage asset.</p>
7. Partnerships	<p>Not only is there partnership working and communication between in-house teams but there is a good working relationship with external flood risk managers such as the Environment Agency and Northumbrian Water.</p> <p>Every quarter there is a meeting of the Durham Strategic Flood Group. This multi-agency forum is proving to be an excellent means to communicate and collaborate in the</p>

	management of drainage assets.
8. Data sharing	<p>There is co-ordinated effort between the Drainage & Coastal Protection Team and the highway maintenance section for the HI's and gully motor crews to pass on information regarding known flooding hot spots and flooding locations that require more than clearance of blocked road gullies, and when significant events happen the highway supervisors pass on relevant information to the Drainage & Coastal Protection Team to inspect. Also there is feed back to the highway section from the Drainage & Coastal Protection Team on what issues have been found, what works are required and what if any amendments to the maintenance regime need to be made.</p>
9. Understanding demand and service delivery requirements	<p>DCC was subject to major flooding in 2012 that resulted in closure of a significant proportion of the major highway network. Meetings were held with emergency services to identify what routes were critical and investigations were carried out to identify what issues on the drainage assets could have contributed to the floods other than extreme rainfall. These investigations highlighted a number of age related problems that were addressed, resulting in greater flood resilience to the county highway network.</p> <p>Regular co-ordination meetings with senior management to report on schemes/investigations progress and highlight any issues or problems.</p> <p>The Drainage & Coastal Protection Team provides updates to local members on major works / investigations in their wards.</p> <p>The Drainage & Coastal Protection Team investigate all flooding issues that cause closures on A & B roads, in an effort to determine cause, responsibilities and what measure need to be implemented, and if need be what capital works are required.</p>
10. Use peoples knowledge	<p>As part of the LGR process the Drainage & Coastal Protection Team made every effort to collect information relating to drainage from the previous district and borough councils. This information is currently held in paper format but is being now scanned into an electronic format for ease of storage and access.</p> <p>The dedicated strategic and operational</p>

	<p>drainage teams comprise professional and technical personnel. They have vast combined drainage experience and knowledge. Especially so with knowledge of the county and its drainage assets, which is vitally important.</p>
11. Resourcing	<p>A body of work has been done on developing reports seeking financial assistance on tackling known issues on the highway network. An element of funding of £250k has been provided for the last 3 financial years.</p> <p>A Specialist Drainage contract has been set up and is into its second term. This provides the Drainage & Coastal Protection Team with a dedicated drainage framework contractor who has been appointed via a competitive tendering process.</p>
12. Solutions	<p>The Drainage & Coastal Protection Team have access to LIDAR data that covers the majority of the county, provided by the Environment Agency. This information is used in conjunction with site specific topographical surveys to develop digital terrains that are imported into hydraulic design software to enable a full and comprehensive drainage design.</p> <p>This enables the team to develop the most cost effective and efficient solution to resolve flooding issues on the highway.</p>

Appendix 5: Examples of Blocked Drainage Assets

A688 Spennymoor



Holmlea-Dipton



Harap Road



Appendix 6: Completed Flood Prevention Schemes



Seaham North Pier - Deck works and foundation improvements



Witton Gilbert - Flood defence scheme



Site 'O' - SuDS pond Cobblers Hall



Housing estate - Draining into SuDS pond



Honest Lawyer - Extent of flooding following Sunderland Bridge roundabout scheme



Honest Lawyer- Flood fence; A167 on one side, River Browney on the other



St Johns Chapel - New headwall arrangement



St Johns Chapel - New outfall to Harthope Burn

Appendix 7: Local Flood Risk Management Strategy