URS

Northumberland County Council

Detailed Water Cycle Study

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EXECUTIVE SUMMARY

Northumberland County Council (NCC) has identified areas with potential for housing and employment development up until the year 2031 through the emerging Local Plan Core Strategy. The Full Draft Plan (December 2014) suggested that there is a requirement for 23,520 new dwellings over the plan period and there is the need to ensure that both the water environment and water services infrastructure has the capacity to sustain the level of development proposed.

Following on from the Outline Water Cycle Study (WCS), produced in May 2012, the aim of the detailed WCS is to identify in detail the constraints on planned housing and employment growth imposed by the water cycle and define what infrastructure and mitigation is required to facilitate development.

The detailed WCS will be used to inform the preparation of the Northumberland Infrastructure Delivery Plan (IDP). The purpose of the IDP is to help ensure that development and growth is enabled by the right infrastructure, delivered at the right time and in the most sustainable and effective way. Developed in partnership with stakeholders including Northumbrian Water (NW) and the Environment Agency, it serves to assist in coordinating and aligning the actions and investment plans of infrastructure providers and regulators to best effect, and in line with the Core Strategy.

The detailed WCS has assessed each aspect of the water cycle at the strategic County level and at a detailed level for each potential development area option within a settlement area.

Wastewater Treatment Assessment

Wastewater Treatment Work (WwTW) Capacity

The detailed WCS identified the following WwTWs across Northumberland that currently have limited or no capacity to accept or treat any further wastewater from the proposed development. These works may require an upgrade to accommodate the new development. If a new hydraulic consent is required at these works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. In the majority of cases this is likely to be achievable within current conventional treatment.

- Hepscott WwTW, Humshaugh WwTW, Wark WwTW, Great Whittington WwTW and Newbiggin WwTW - No Headroom Available and no solution currently identified but a solution is likely to be possible within limits of conventional treatment
- Tranwell WwTW - No Headroom Available and no solution available and WwTW cannot be upgraded
- Lynemouth WwTW and Haydon Bridge WwTW - No Headroom Available until infiltration is removed
- Rothbury WwTW, Cornhill on Tweed WwTW and Seahouses WwTW - No Headroom Available, NW Flow and Load investigations required
- Pegswood WwTW - No Headroom available and likely WQ consent constraints
- Allendale WwTW, Barrasford WwTW and Fourstones WwTW - Limited Headroom Available until surface water ingress is removed

The Northumberland IDP (through annual updates) will be used to identify the WwTWs that require upgrades in liaison with NW. NW will commence investment procedures to provide capacity at the WwTWs once the potential development is certain.

Sewer Network Capacity

The detailed WCS identified several potential development area options where development is likely to exacerbate predicted performance issues with respect to sewer capacity. Possible infrastructure upgrades may be required in these areas before development can commence and include the areas of Prudhoe, Corbridge and Seaton Valley.

NW have identified several potential development area options that they would object to due to the proximity of the new development to the WwTW. Therefore development should be located away from the WwTWs where possible or alternative potential development area options progressed. These areas include Wooler, Amble and Cornhill on Tweed.

NW would also require a full odour assessment to support the planning application for some potential development area options. Therefore development should be steered away from the WwTWs or alternative potential development area options progressed for this settlement as a first choice option.

Any new development must consider the impact of further urbanisation on the existing wastewater and surface water system, and discharge of surface water must be mitigated within the pumped limitations of the drained system.

Wastewater Policy Recommendations

The detailed assessment of wastewater capacity and infrastructure requirements within this WCS has identified several key recommendations, including the requirement for all planning applications in constrained areas to be subject to a pre-development enquiry with NW, and for detailed foul and surface water strategies to be built into masterplans for Morpeth, Ponteland, Prudhoe, Blyth and Scremerston.

Ecology and Biodiversity Assessment

The detailed WCS has assessed the impacts of increased discharges from WwTWs on designated water dependent ecological sites. An assessment of the level of risk was undertaken to determine where additional detailed analysis will need to be considered and agreed between NW and the Environment Agency as part of any future application to increase the permitted discharge volumes at key WwTWs.

The risk assessment highlighted the following WwTWs as needing further detailed assessment as development comes forward:

- Rothbury WwTW – discharges directly into the sensitive River Coquet & Coquet Valley Woodlands SSSI, which has traditionally had water quality issues;
- Wooler WwTW – discharges a short distance upstream of the Till Riverbank SSSI, River Tweed SAC and Tweed Catchment Rivers: Lower Tweed & Whiteadder SSSI, all of which have significant water quality constraints due to high phosphate loading;
- Whalton WwTW – discharges into the How Burn, which already has known water quality issues linked to point source and diffuse pollution; and
- Barrasford WwTW, Wark WwTW and Humshaugh WwTW – all discharge into the River North Tyne which is a stronghold for freshwater pearl mussel, which is highly sensitive to deteriorating water quality.

- Development within the catchment of Scots Gap WwTW & (to a lesser extent) Pegswood WwTW will require consideration of the potential impact on the large white-clawed crayfish population of the River Wansbeck catchment. Any proposals that would result in deterioration in phosphate loading in the river and its catchment would adversely affect this population.

Water Resources Supply Assessment

Northumberland County is served by two main water resource planning zones (WRZ) used by NW in their management of water resources. The Berwick and Fowberry WRZ supplies the most northern section of NCC's North Northumberland Delivery Area and the Kielder WRZ supplies the rest of the County.

There is a large surplus of available raw water within the Kielder WRZ, therefore there is no requirement to plan a new water resource scheme to supply new developments located in this WRZ.

At present, the Berwick and Fowberry WRZ has significant surplus supply, however the Environment Agency has identified uncertainty in the sustainability of the Berwick abstractions providing this surplus, therefore an investigation has been planned for completion between 2015-20 to assess the sustainable yield of the boreholes. The investigation may lead to a reduction in abstraction volumes which are currently licensed causing a significant reduction in available water for this WRZ after 2020. NW are currently working on a programme to refurbish and better maintain each borehole in the Berwick and Fowberry WRZ, with the aim of completion by 2020. This will improve the output of each source and improve resilience to the WRZ. In the meantime, in order to increase the resilience of the Fowberry area, the Environment Agency has agreed to the Fowberry abstraction licence variation, which allows the current levels of abstraction to be maintained from the boreholes in that area.

The following Settlement Areas are located within the Berwick and Fowberry WRZ :

- Berwick upon Tweed
- Wooler
- Norham
- Cornhill on Tweed
- Scremerston

For growth in these areas, it is recommended that:

- NW are consulted on the water supply for all proposed development;
- developers should ensure that all housing is as water efficient as possible, and non-domestic building should as a minimum reach 'Good' BREEAM status;
- a programme of retrofitting and water audits of existing dwellings and non-domestic buildings should be considered; and
- a programme of water efficiency promotion and consumer education should be established, with the aim of behavioural change with regards to water use.

Flood risk management and drainage

Several key developments are likely to be located in Flood Zones 2 or 3, including Morpeth, Ponteland and Hexham. Greater investment in flood defence and mitigation of flooding both to and from the site is likely to be required at these locations

The detailed WCS used data from the Level 2 Strategic Flood Risk Assessment and the Environment Agency's published flood maps to determine the general level of surface water flood risk associated with the proposed potential development area options. The majority of the potential development area options assessed are at risk of surface water flooding to some degree, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used for all new developments.

The assessment of the likely capacity for infiltration type SuDS showed that several potential development area options are unlikely to be suitable for infiltration based SuDS due to low permeability superficial geology or being located within source protection zones for public water supply abstractions. These sites, including South East Morpeth, Pegswood, Longhorsley and Blyth (Bates Colliery Site), will therefore be reliant on surface attenuation and surface water runoff restriction, which will require sites to make land provision for this mitigation.

Developers will need to engage with NCC and Environment Agency with regards to infiltration SuDS for potential development area options where groundwater surface water interaction and pollution risk are potential constraints.

Phasing of development and infrastructure

NW are unable to commit to delivering upgrades to infrastructure at a specific year in the future due to phasing of development, however, NW will continue to invest in headroom at WwTWs and new infrastructure as a requirement when development is confirmed, and this will be monitored through the NCC IDP. The IDP will be updated annually to reassess infrastructure capacity and needs. This review process will be critical to capture changes and will also be a key mechanism by which the Council, NW, the Environment Agency and other stakeholders will work collaboratively to appraise investment needs, overcome any capacity constraints and address environmental considerations.

Planning applications which propose that phasing of certain development is taken forward should consult with NW to identify what infrastructure investment may be required, and when this may be feasible. Strategic approaches to development phasing should be considered for areas where developers and key stakeholders may need to work together for a larger strategic solution (for example in Morpeth).

WCS Periodic Review

The WCS should remain a living document, and be reviewed on an annual basis as development progresses and changes are made to the various studies and plans that support it; these include:

- five yearly reviews of NW's Water Resources Management Plan (WRMP) (the next full review is due in 2019, although interim reviews are undertaken annually);
- second round of River Basin Management Plan (RBMP) updates due by 2015;
- Periodic review 2014 (PR14) (NW's business plan for AMP6 – 2015 to 2020); and
- Climate change impact assessment milestones.

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ACRONYMS AND ABBREVIATIONS	
Abbreviation	**Description**
AMP	Asset Management Programme
AONB	Area of Outstanding Natural Beauty
BAP	Biodiversity Action Plan
BGS	British Geological Survey
BOD	Biochemical Oxygen Demand
BWD	Bathing Water Directive
CAMS	Catchment Abstraction Management Strategy
CDA	Critical Drainage Area
CFMP	Catchment Flood Management Plan
CIL	Community Infrastructure Levy
CSO	Combined Sewer Overflow
CLG	Communities and Local Government
DEFRA	Department for Environment, Food and Rural Affairs
DO	Dissolved Oxygen
DPD	Development Plan Document
DWF	Dry Weather Flow
DWI	Drinking Water Inspectorate
FEH	Flood Estimation Handbook
GW	Groundwater
HMWB	Heavily Modified Water Body (under the Water Framework Directive)
HRA	Habitat Regulations Assessment
l/h/d	Litres/head/day (a water consumption measurement)
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LP	Local Plan
LPA	Local Planning Authority
MCZ	Marine Conservation Zone
Ml	Mega Litre (a million litres)
N	Nitrate

ACRONYMS AND ABBREVIATIONS	
Abbreviation	**Description**
NCC	Northumberland County Council
NE	Natural England
NFCDD	National Flood and Coastal Defence Database
NNP	Northumberland National Park
NPPF	National Planning Policy Framework
NW	Northumbrian Water Ltd
OFWAT	The Water Services Regulation Authority (formerly the Office of Water Services)
OR	Occupancy Rate
PE	Population Equivalent
PPS	Planning Policy Statement
PR	Periodic Review
Ramsar	Ramsar Convention
RBD	River Basin District
RBMP	River Basin Management Plan
RoC	Review of Consents
RQP	River Quality Planning
SAC	Special Area for Conservation
SEPA	Scottish Environmental Protection Agency
SFRA	Strategic Flood Risk Assessment
SHLAA	Strategic Housing Land Availability Assessment
SPA	Special Protection Area
SPZ	Source Protection Zone
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SW	Surface Water
SWD	Shellfish Waters Directive
SWMP	Surface Water Management Plan
uFMfSW	Updated Flood Map for Surface Water
UKTAG	United Kingdom Technical Advisory Group (to the WFD)

ACRONYMS AND ABBREVIATIONS	
Abbreviation	**Description**
WCS	Water Cycle Study
WFD	Water Framework Directive
WRMP	Water Resource Management Plan
WRZ	Water Resource Zone (in relation to a water company's WRMP)
WwTW	Waste Water Treatment Works

1 INTRODUCTION

1.1 Background

Northumberland will experience planned development in both housing and employment provision in line with the Local Plan Core Strategy plan period. This expansion, which aims to meet local housing requirements and facilitate economic growth within the county, has the potential to pose environmental challenges, in particular in relation to the local water environment. Historic flooding is an issue in the county, and the water environment is affected by areas of poor water quality and the requirement to maintain the integrity of local habitat designations dependent on the local water environment. Therefore the proposed development must be sustainable, delivering not only the Core Strategy objectives but also water services and infrastructure which have the capacity to sustain the proposed development in a sustainable way, without adversely impacting on the water environment.

Northumberland County Council (NCC) has identified areas with potential for development up until the year 2031 and this detailed Water Cycle Study (WCS) will be an important part of the evidence base to demonstrate that the growth target in totality is deliverable and sustainable from a water perspective. The WCS will provide guidance to NCC in determining the most appropriate locations for proposed development (with respect to local water infrastructure and the wider water environment) in the Local Plan, either in the form of strategic sites allocated within the Core Strategy, or as other sites to be allocated in a future Delivery Plan Document.

The objective of the WCS is to identify any constraints on planned housing and employment growth that may be imposed by the water cycle. The WCS then identifies how these can be resolved i.e. by ensuring that appropriate Water Services Infrastructure can be provided to support the proposed development without adversely affecting the water environment. Furthermore, it should provide a strategic approach to the management and use of water which ensures that the sustainability of the water environment in the county is not compromised.

The WCS will be used to inform the preparation of the Northumberland Infrastructure Delivery Plan (IDP). The purpose of the IDP is to help ensure that development and growth is enabled by the right infrastructure, delivered at the right time and in the most sustainable and effective way. Developed in partnership with stakeholders including Northumbrian Water (NW) and the Environment Agency, it serves to assist in coordinating and aligning the actions and investment plans of infrastructure providers and regulators to best effect, and in line with the Core Strategy.

1.2 Northumberland Water Cycle Study History

Current Environment Agency guidance for the delivery of a WCS suggests that in general they should be undertaken in three stages; an initial Scoping, Outline, and Detailed Study.

The Scoping and Outline report assessed the baseline conditions of various elements of the water cycle in Northumberland, including the natural water environment and the capacity of sewer networks that would be used to support the growth of proposed developments. Whilst the Scoping WCS was not published upon completion in 2009, key stakeholder agreement and use of the WCS Outline findings aided the development of both the Outline and this Detailed WCS.

The Outline Water Cycle Study, produced in May 2012, was undertaken to identify any constraints that the proposed development may have upon the water cycle and how these can be resolved. Furthermore, it provides a strategic approach to the management and use of water which ensures that the sustainability of the water environment in the study area is not compromised.

The aim of the Detailed Water Cycle Study is to define what specific infrastructure and mitigation is required to facilitate development within Northumberland up to the plan period of 2031, and thereby supersedes the 2012 Outline Study. This is in line with NCC's emerging Core Strategy, taking into account the Preferred Options and the Full Draft Plan documents which gave a greater insight and confirmation of proposed development and associated scenarios for housing, employment and Green Belt.

1.3 Detailed WCS Scope

Whilst a detailed WCS can vary in both scope and remit the overall aim of the detailed WCS is to define what infrastructure and mitigation is required to facilitate development, to inform decisions made on the location of and the likely intensity and type of development.

This detailed WCS provides information at a level suitable to ensure that there are solutions to deliver growth for the preferred development allocations. In this instance this relates to the enhanced provision of housing and related services in the County of Northumberland in line with the Local Plan, and the potential constraints to the water cycle which such development may pose. The WCS will be used to inform the NCC Infrastructure Development Plan (IDP), which will outline a strategic plan for development and infrastructure investment across Northumberland County over the planning period. The IDP will be updated annually in order to reassess investment needs, overcome any capacity constraints and address environmental considerations.

The following sets out the key objectives of the Detailed WCS for NCC:

- Determine if solutions to wastewater treatment for each growth location are required and how this might impact phasing of development within (and around) each growth location;
- Determine whether any Habitats Directive designated ecological sites have the potential to be impacted (either adversely or beneficially) by the wastewater treatment strategy via a screening process;
- Determine whether additional water resources are required to support growth;
- Determine upgrades required to water supply infrastructure relative to potential options for growth;
- Provide detail on SuDS constraints/opportunities, surface water and flood risk for each development location;
- Identification of opportunities for the implementation of sustainable green infrastructure;
- Provision of developer guidance for sustainable new development which protects/enhances Northumberland's water environment and assets.

The detailed WCS will comprise a holistic assessment of flood risk considering the interactions within local and neighbouring communities and authorities, and the integration of other Flood and Water Management Act 2010 duties including SuDS approval. The WCS and suggested measures will also coordinate with existing council plans and procedures where possible and employ sustainable measures i.e. those which are achievable yet deliver results in line with policy guidelines.

1.4 Report Structure

For ease of reference, this report has been divided into a number of sections to assist its purpose as a primarily planning based source of evidence:

- The proposed growth of the planned development in relation to the water cycle assessment (Chapter 2);
- The assessment methodology for each water cycle element (Chapter 3);
- An assessment of county wide water cycle elements (Chapter 4);
- A summary the new development area assessments for each Settlement Area (Chapter 5); and,
- Infrastructure recommendations, funding and developer's guidance (Chapter 6).

Additional information relating to the legislative drivers which shape the detailed WCS and the developer checklist for compliance with the WCS can be found in the appendices.

1.5 Policy Review

National, regional, sub-regional and local planning policy and guidance documents provide both requirements and guidance for delivering sustainable development.

A full list of the key legislative drivers shaping the study is detailed in Appendix A. Many of these have been updated since the Outline WCS[1] as part of legislative/policy revisions.

Other relevant studies that have a bearing on the provision of water services infrastructure for development and have been considered developing the detailed WCS include, but are not limited to, the following key documents:

- Northumberland Outline WCS Report (2012)
- Northumberland Level 1 Strategic Flood Risk Assessment (SFRA) (2010)
- Northumberland Level 2 SFRA (2015)
- Northumberland Local Flood Risk Management Strategy (2015)
- Northumbrian Water Limited (NW) Water Resources Management Plan (WRMP) 2015-2020 (2014)[2]
- Northumberland Coast Shoreline Management Plan 2 (2009)[3]
- Northumberland Coast Area of Outstanding Natural Beauty Management Plan 2014-2019[4]

[1] URS (2012) NCC Outline Water Cycle Study, Northumberland County Council
[2] Northumbrian Water Limited, 2014. Final Water Resources Management Plan 2014. https://www.nwl.co.uk/your-home/environment/current-WRMP.aspx
[3] Northumberland Coast Shoreline Management Plan 2 (2009) http://www.northumberland-smp2.org.uk/
[4] Northumberland Coast Area of Outstanding Natural Beauty Management Plan 2014-2019 http://www.northumberland.gov.uk/default.aspx?page=6880

- Berwickshire and North Northumberland Coast European Marine Site Management Scheme 2014[5]
- Northumbria River Basin Management Plan (2009)[6]
- Solway Tweed River Basin Management Plan[7] (2009)
- River Tyne Catchment Flood Management Plan (CFMP) (2009)[8]
- River Eden CFMP (2009)[9]
- North East Northumberland CFMP (2009)[10]
- Wansbeck and Blyth CFMP (2009)[11]
- Till and Breamish CFMP (2009)[12]
- The River Tyne Abstraction Licensing Strategy (2013)[13]
- The River Till Abstraction Licensing Strategy (2013)[14]
- The Northumberland Rivers Abstraction Licensing Strategy (2013)[15]
- Northumberland Green Infrastructure Strategy (2011)[16]

1.5.1 *Local Plan*

The Northumberland Local Plan is a collection of documents containing the planning policies that are used to assess planning applications and guide the location of future development in the County. Some of these documents are currently under preparation.[17]

The principal policy document in the Northumberland Local Plan is the Core Strategy, which provides the overarching planning policies that will:

- guide where future development takes place up to 2031,
- guide how proposals for new developments will be assessed,
- provide the policies to help protect Northumberland's environment,
- set out the general scale and distribution of new development, and,
- set out strategic allocations for housing and employment.

[5] Berwickshire and North Northumberland Coast European Marine Site Management Scheme 2014 http://www.xbordercurrents.co.uk/wp-content/uploads/2011/11/BNNC-EMS-FINAL-MANAGEMENT-SCHEME-MAY-2014-v1.0.pdf
[6] Northumbria River Basin Management Plan (2009) https://www.gov.uk/government/publications/river-basin-management-plan-northumbria-district
[7] Solway Tweed River Basin Management Plan (2009) http://www.sepa.org.uk/water/river_basin_planning/solway_tweed.aspx
[8] River Tyne CFMP (2009) https://www.gov.uk/government/publications/river-tyne-catchment-flood-management-plan
[9] River Eden CFMP (2009)https://www.gov.uk/government/publications/eden-catchment-flood-management-plan
[10] North East Northumberland CFMP (2009) https://www.gov.uk/government/publications/north-east-northumberland-catchment-flood-management-plan
[11] Wansbeck and Blyth CFMP (2009) https://www.gov.uk/government/publications/rivers-wansbeck-and-blyth-catchment-flood-management-plan
[12] Till and Breamish CFMP (2009) https://www.gov.uk/government/publications/river-till-and-breamish-catchment-flood-management-plan
[13] Tyne Abstraction Licensing Strategy (2013) https://www.gov.uk/government/publications/tyne-abstraction-licensing-strategy
[14] Till Abstraction Licensing Strategy (2013) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307345/lit_7871_57eb85.pdf
[15] The Northumberland Rivers Abstraction Licensing Strategy (2013) https://www.gov.uk/government/publications/northumberland-rivers-abstraction-licensing-strategy
[16] Northumberland County Council Green Infrastructure Strategy (2011) http://www.northumberland.gov.uk/default.aspx?page=3458
[17] Further information on the Northumberland Local Plan, the planning documents and policies supporting this, and their current status is available on the Northumberland County Council website: http://www.northumberland.gov.uk/default.aspx?page=3443

The detailed WCS forms an evidence base to support and inform the preparation of the Core Strategy and the allocation of future development over the plan period. The consultation on the full draft of the Core Strategy took place between December 2014 and February 2015 and the final Core Strategy is due to be adopted during 2016.

The full draft Core Strategy includes a number of policies relevant to flood risk management, water resources and water quality: Policy 1 – Sustainable Development, Policy 29 – Water Quality, Policy 30 – Water Supply and Sewerage, Policy 31 – Flooding; Policy 32 – Sustainable Drainage Systems and Policy 33 – Coastal Erosion and Coastal Change Management.

2 DEVELOPMENT IN NORTHUMBERLAND

2.1 Northumberland Study Area

Northumberland is predominantly a rural area located in the North East of England, to the north of Newcastle-upon-Tyne and to the south of the Scottish border and its administrative area covers approximately 500,000 hectares[18]. Northumberland's physical geography is characterised by upland moorland, hills, valleys, coastal lowlands and estuaries. It has a current population of approximately 316,000 but is the least densely populated county in England.

Over half of the population lives within the urbanised, former deep-coal mining area, south east of the County which covers 5% of the total county area. Consequently, there is a very low population density in the rural north and west. Approximately 25% of the County is designated as part of the Northumberland National Park (NNP), which lies to the west of the County and is largely protected from development. Part of the Northumberland Coast is a designated Area of Outstanding Natural Beauty (AONB) - which covers 39 miles of coastline from Berwick-upon-Tweed in the north to the mouth of the River Coquet in the south. The North East Pennines AONB also encompasses a large proportion of the south west of Northumberland. There are also a large number or designated sites located within the study area.

For the purposes of development planning, the Core Strategy divides Northumberland into four delivery areas: North Northumberland, Central Northumberland, South East Northumberland and West Northumberland (Figure 2-1). These areas have been defined by:

- areas with similar social, economic and cultural characteristics;
- the roles and relationships between the towns and villages; and
- the interaction and reliance on areas outside of the region, particularly Tyneside and Scotland.

These delivery areas have replaced the three strategic housing market areas (SHMAs) that were used to assess growth in the Outline WCS.

2.1.1 *Southeast Northumberland Delivery Area*

The Southeast Northumberland delivery area extends inland from the coast, with its Southern boundary in North Tyneside and Newcastle upon Tyne to its Northern boundary in Amble. The Green Belt to the south prevents development merging with the Tyneside conurbation. Important green infrastructure (GI) links are apparent along the coast which benefits from nature conservation designations. This delivery area is the most densely populated region in Northumberland with 737 people per km^2. Ashington, Bedlington, Blyth, Cramlington and Amble (located in the southern part of the Northumberland Coast AONB) have the largest concentrations of housing, employment, retailing and services in the area. The Blyth Estuary Strategic Employment Area is an important employment area, and Cramlington is a sub-regional centre for industry, which has the largest concentration of manufacturing businesses in Northumberland. The Delivery Area is closely linked with the Tyneside Conurbation to the South due to close proximity and good road links. Morpeth and Alnwick, in the Central and North Northumberland Delivery Areas respectively, provide employment and housing opportunities for Cramlington and Blyth.

[18] Northumberland County Council (December 2008) Northumberland County Council Annual Monitoring Report 1 April 2007 to 31 March 2008, http://www.northumberland.gov.uk/idoc.ashx?docid=8519a951-5cf9-4095-86dc-5593e8cd0da6&version=-1

2.1.2 *Central Northumberland Delivery Area*

Much of the Central Northumberland delivery area is covered by Green Belt and the south west of the area includes part of the North Pennines AONB. Morpeth, Hexham, Ponteland and Prudhoe are main towns providing key hubs for housing, employment, retailing and other services for their own populations and a wider rural catchment area. Corbridge is an important historic service centre which has a commuter housing role as well as providing services to a wider rural area. The area has a population density of 83 people per km^2.

The Central delivery area has some of the highest levels of development pressure within Northumberland as the towns are within close proximity to Tyneside, therefore they are popular locations for commuters. Hexham and Morpeth provide employment and services for the West and North Northumberland delivery areas respectively. Morpeth also has a strong relationship with Cramlington and the South East Northumberland delivery area.

2.1.3 *North Northumberland Delivery Area*

The North Northumberland delivery area is bounded to the north by the Scottish Border, to the West by the Cheviot Hills, to the South by the Coquet Valley and to the east by the coast, which is designated as an AONB. The area is sparsely populated, with an overall density of 26.3 people per km^2.

The towns of Berwick-upon-Tweed and Alnwick are key locations for housing, employment, retailing and services within the Area. Belford and Seahouses provide a range of services for local communities and to the tourism industry.

Development pressure in the AONB poses a threat to the conservation of its natural beauty but the sustainability of local communities by providing housing and employment opportunities is also considered to be integral to its protection and enhancement.

2.1.4 *West Northumberland Delivery Area*

The West Northumberland delivery area includes the Southern area of the Northumberland National Park, the Kielder area to the north-west of the National Park, the North Tyne Valley, the South Tyne Valley, as well as parts of Hadrian's Wall and the North Pennines AONB. The Area is the most sparsely populated in the County with 11.2 people per km^2. Haltwhistle, the largest settlement in the area, is a hub for housing, employment, retailing and other services. Bellingham is the largest settlement in the North Tyne Valley, providing services to a wide rural area and access to the National Park, Kielder Water and Forest Park. Allendale and Haydon Bridge are key settlements for local housing and services. The economy of the area is dominated by agriculture, forestry and tourism.

Haltwhistle, Haydon Bridge and Bardon Mill have connections to Hexham, Carlisle and the Tyneside conurbation. The eastern part of the delivery area is on the periphery of the main Tyneside commuter zone.

2.2 Planned New Development

Within the four delivery areas, NCC has identified a number of settlements for potential new development. The Full Draft Plan suggests that there is a requirement for 23,520 new dwellings (an average of 1,176 dwellings per annum) over the plan period 2011 to 2031.

In addition to housing, NCC must ensure an adequate amount of land is provided for economic development and employment. The Strategic Economic Plan for the North East[19] aims that by 2024, the North East Local Enterprise Partnership area will provide over one million jobs, representing 100,000 new jobs and equivalent to an 11% increase in employment from 2014. This translates to a vision for an additional 10,000 new jobs in Northumberland (in headcount terms) during the Plan period to 2031, requiring around 150 hectares of employment land. While this only represents around half of the total employment land in the County that is currently available, the uneven distribution of suitable sites means that NCC are investigating how the availability and suitability of employment land may need to be rebalanced around the County.

The housing development and employment growth figures assessed in the detailed WCS have been provided by NCC and are based on the Northumberland Local Plan: Core Strategy Preferred Options for Housing, Employment and Green Belt (October 2013) and the Core Strategy Full Draft Plan (December 2014). Table 2-1 summarises the housing and employment figures for the main towns, service centres and the rest of the delivery area in the four delivery areas across Northumberland.

2.2.1 *Housing Figures*

The following assumptions have been used for the assessment of the potential housing figures:

- A number of settlements have more than one housing development scenario; for instance, Morpeth has four potential scenarios ranging from 1500 to 2500 planned dwellings (Table 2-1). The detailed WCS has assessed each settlement area against the current status of the local water infrastructure and water environment, and identified if any significant constraints would limit the level of development in the settlement over the plan period. NW has provided their WwTW capacity assessment for this study, which is based on current capacities. Further details of the WwTW capacity assessment methodology are discussed in Section 3.1).
- The assessment of the potential housing development in Northumberland has been phased over four time periods, 2011-2016, 2016-2021, 2021-2026 and 2026-2031 and it has been agreed with NCC that for the detailed WCS assessment, the total proposed housing development for each settlement has been equally divided across these time periods at this point in time. It is recognised that the phasing of development may be dependent on infrastructure provision.

2.2.2 *Employment Figures*

The NCC Core Strategy forecasts that there will be an increase of 10,000 new jobs in Northumberland (in headcount terms) during the Plan period to 2031. NCC has identified land available across the County for potential employment growth (in hectares), however it is unclear how the 10,000 jobs will be distributed across these areas at this stage, as the type of employment is uncertain.

[19] North East Local Enterprise Partnership (2014) More and Better Jobs – A Strategic Economic Plan for the North East

2.2.3 *Potential development area options*

For each of the settlement areas, e.g. Alnwick, Berwick upon Tweed, Belford, etc., a number of potential development area options are being considered by NCC, to inform strategic planning decisions. For each potential development area option, NCC has identified an indicative number of housing or employment development for assessment. The number of potential housing developments were identified using the Strategic Housing Land Availability Assessment (SHLAA), which assesses sites with potential for housing on their suitability and the likelihood of the development coming forward in the future (the availability and achievability). Whilst the potential development areas for housing have been informed by the SHLAA, not all SHLAA sites have been examined. The potential development areas are focussed on the larger scale SHLAA sites or collections of SHLAA sites, which has been refined by the assessment of the most suitable, available and achievable sites. The sites are not an exhaustive list and there are other SHLAA sites which could contribute towards delivering the proposed housing numbers set out in the Core Strategy.

In some cases, the total number of housing units or employment allocations across the potential development area options exceeds the total number of housing or employment development set out in the Core Strategy for each settlement area. Therefore, the potential development area option allocations provide a range of development scenarios. This particularly applies to the potential development area options grouped under 'Rest of Delivery Area', where the sum of the individual potential development area option housing figures is greater than the Core Strategy allocation.

2.2.4 *Tourism*

As part of the detailed WCS, the impact of tourism has been considered alongside the increase in housing and employment across the County. Tourism is an essential and growing part of Northumberland's economy, as outlined by the Northumberland Core Strategy Full Draft Plan[20] Policy 11. With continued growth in the tourism sector there is the potential for increased pressures upon local infrastructure, including that of water infrastructure and services from transient populations. This threat is confirmed in the introduction of Policy 11, which states that "*the development of new visitor attractions and facilities, accommodation and the expansion of existing tourism businesses will be supported*". Therefore, development in the area must be sustainable in regards to water resources and the treatment of the additional flows to support visiting populations now and in the future.

[20] NCC (2014) Northumberland Core Strategy Full Draft Plan http://www.northumberland.gov.uk/default.aspx?page=3443

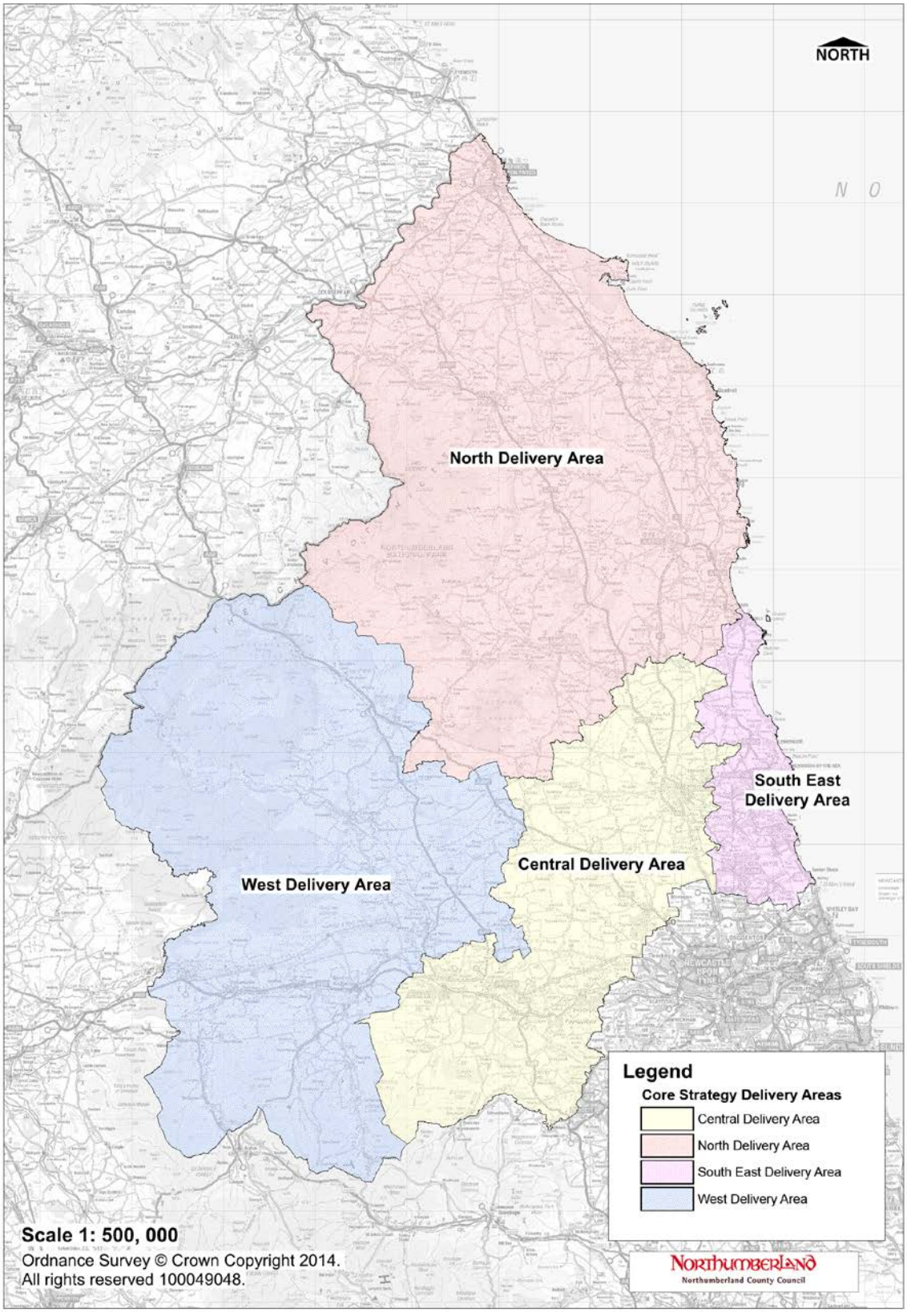

FIGURE 2-1 – NORTHUMBERLAND AND ITS FOUR DELIVERY AREA

TABLE 2-1: SUMMARY OF HOUSING AND EMPLOYMENT SCENARIOS

Delivery Area	Settlement		Housing Scenario	Potential Phased Housing Development (Dwellings)					Employment Land (ha)
				2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total	
North	Alnwick		1	250	250	250	250	**1000**	19.566
	Berwick upon Tweed		1	225	225	225	225	**900**	8.811
			2	210	210	**210**	210	**840**	
	Belford		1	50	50	50	50	**200**	0.776
			2	50	60	60	60	**230**	
	Seahouses		1	75	75	75	75	**300**	0.834
			2	50	60	60	60	**230**	
	Wooler		1	95	95	95	95	**380**	2.086
			2	70	70	70	70	**280**	
	Rothbury		1	95	95	95	95	**380**	-
			2	50	50	50	50	**200**	
		Glanton	1	10	10	10	10	**40**	-
		Whittingham	1	10	10	10	10	**40**	-
		Norham Cornhill Scremerston	1	25	25	25	25	**100**	-
	Rest of North Delivery Area	Acklington Amble (within Warkworth Parish) Warkworth Christon Bank Cornhill on Tweed Eglingham Ellingham Embleton Felton Glanton Hipsburn Lesbury Longframlington Longhoughton Lowick Lucker Millfield Newton on the Moor Norham Powburn Rennington Rock Scremerston Shilbottle South Charlton	2	275	275	275	275	**1100**	-
		Millfield	-	-	-	-	-	**-**	0.587
Central	Hexham		1	225	225	225	225	**900**	19.325
			2	180	180	180	180	**720**	
	Morpeth		1	625	625	625	625	**2500**	22.845
			2	550	550	550	550	**2200**	
			3	525	525	525	525	**2100**	
			4	375	375	375	375	**1500**	
	Prudhoe		1	250	250	250	250	**1000**	11.594
			2	215	215	215	215	**860**	
	Corbridge		1	75	75	75	75	**300**	-
			2	60	60	60	60	**240**	
	Ponteland and Darras Hall		1	212	212	213	213	**850**	3
			2	160	160	160	160	**640**	
	Rest of Central Delivery Area	Stocksfield Wylam Ovingham Horsley Hedley on the Hill Heddon on the Wall St Mary's Hospital Stannington Longhirst Whalton Marley Tile Site Stannington Station Tranwell Woods Longhorsley Scots' Gap	1	430	430	430	430	**1720**	6.523 Only applies to Stocksfield and Marley Tiles
			2	280	280	280	280	**1120**	
		Eltringham	-	-	-	-	-	**-**	1.909
		Newcastle Airport							14.977
		Whitehouse Business Centre (Stannington)							1.011
		Bywell Home Farm							0.090

TABLE 2-1: SUMMARY OF HOUSING AND EMPLOYMENT SCENARIOS

Delivery Area	Settlement		Housing Scenario	Potential Phased Housing Development (Dwellings)					Employment Land (ha)
				2011 - 2016	2016 - 2021	2021 - 2026	2026 - 2031	Total	
South East	Amble		1	185	185	185	185	**740**	10.916
			2	150	150	150	150	**600**	
	Ashington		1	400	400	400	400	**1600**	29.005
			2	450	450	450	450	**1800**	
	Bedlington		1	300	300	300	300	**1200**	-
			2	320	320	320	320	**1280**	
	Blyth		1	870	870	870	870	**3480**	227.472
			2	715	715	715	715	**2860**	
	Cramlington		1	870	870	870	870	**3480**	102.602
			2	955	955	955	955	**3820**	
	Guidepost Stakeford Choppington		1	105	105	105	105	**420**	0.212
			2	95	95	95	95	**380**	
	New biggin by the Sea		1	80	80	80	80	**320**	-
			2	75	75	75	75	**300**	
	Seaton Valley		1	200	200	200	200	**800**	1.419
			2	195	195	195	195	**780**	
	Rest of South East Delivery Area	Lynemouth Ellington Widdrington Station Stobsw ood Hadston	1	195	195	195	195	**780**	1.22
			2	180	180	180	180	**720**	
West	Haltw histle		1	100	100	100	100	**400**	1.449
	Allendale		1	25	25	25	25	**100**	1.133
	Haydon Bridge		1	50	50	50	50	**200**	-
	Bellingham		1	75	75	75	75	**300**	0.223
			2	70	70	70	70	**280**	
	Rest of West Delivery Area	New borough Humshaugh Barrasford Gunnerton Great Whittington Bardon Mill/ Redburn/ Henshaw Gilsland	1	120	120	120	120	**480**	-
			2	105	105	105	105	**420**	

3 DETAILED WCS ASSESSMENT METHODOLOGY

3.1 Wastewater Treatment and Collection Assessment

New development will create addition wastewater that will need to be treated at an existing, or potentially new wastewater treatment works (WwTW). The proposed housing and employment growth figures for each settlement have been assessed to determine the potential impact on the capacity of the existing WwTWs. From the proposed potential development areas outlined in the NCC Core Strategy (Table 2-1), the following settlements are not connected to the NW sewerage network, and therefore will not be included in the WwTW assessment:

- Gilsland,
- Whitehouse Business Centre (Stannington),
- Bywell Home Farm,
- Marley Tile Site, and
- Millfield.

The assessment of the capacity of the WwTWs has two stages:

Stage 1) Define the amount of new development growth that will drain to each WwTW and calculate the additional wastewater flow this will generate.

The additional flow has been calculated using the following equation:

Additional flow = (No. of new dwellings*domestic consumption rate*occupancy rate) + (employment jobs*non-domestic consumption rate)

The data sources used and assumptions made for this assessment are summarised in Table 3-1.

TABLE 3-1: DATA SOURCES AND ASSUMPTIONS USED IN THE WWTW CAPACITY ASSESSMENT

Data Source	Assumptions
• Housing and employment growth figures from NCC Core Strategy. • Ww TW catchment GIS layer from NW. • Ww TW consented Dry Weather Flow (DWF) provided by the Environment Agency. • NW Ww TW assessment compliance and production comments and overall Ww TW capacity comments.	• Occupancy rate of 2.1. • Domestic consumption rate of 125 litres per head per day (l/h/d). • Non-domestic consumption rate of 20 (l/h/d).

Stage 2) Determine whether the growth can be accommodated within existing headroom.

NW have provided an assessment of the headroom available at each WwTWs, identifying the current compliance and production constraints and ability for the works to accommodate the proposed growth.

The results for each WwTW are presented in a Red/Amber/Green (RAG) Assessment for ease of planning reference. The RAG code refers broadly to the following categories in Table 3-2:

TABLE 3-2: KEY FOR WASTEWATER CAPACITY RAG ASSESSMENT		
There are no expected capacity constraints at this WwTW	**There is limited capacity at the WwTW, however NW have identified potential actions to allow more headroom**	**There is limited capacity at the WwTW and a solution has not yet been identified.**

3.1.1 *Tourism Sensitivity Analysis*

As part of the detailed WCS, the impact of tourism has been considered alongside the increase in housing and employment across the County. The increase in wastewater flows has been included in NW's WwTW capacity assessment.

In terms of the impact on water supply, the NW Water Resources Management Plan 2014 (WRMP) states that the water company no longer assesses tourism specifically because excessive peaks in demand are no longer experienced in the summer months. This is due to the reduction in heavy industry and the National Shut Down Week in industry is no longer used. Instead, Northumberland is a popular year round tourist destination and the demand increase is smoothed out across the year.

3.2 Water Quality Assessment

In order to determine the water quality impacts of further discharge, the assessment considered the current standards which apply to discharges at each RAG (Table 3-2) assessed 'red' and 'amber' WwTW without growth to determine how much further they could theoretically be controlled (or conditioned) within the limits of conventionally applied treatment. This would give an indication of where there is a risk that further growth could require conditions on the discharge that cannot be met with conventional technology and hence where a solution may not be achievable at those growth levels assessed.

Each of the consents to discharge for the WwTWs classified as 'red' or 'amber' for capacity were assessed in terms of their quality conditions, and the water quality condition for each discharge parameter compared to the value at which it is considered that further improvements cannot be achieved using conventionally applied treatment. The industrial standard limits of conventionally applied treatment processes are:

- 5mg/l for BOD;
- 1mg/l for Ammoniacal-N; and
- 1mg/l for Phosphate.

Further detailed assessment of the water quality impacts of further discharge would involve undertaking detailed water quality modelling of discharge against Water Framework Directive (WFD) targets for each WwTW with a RAG (Table 3-2) assessment of 'red' and 'amber' . Modelling to this level would require detailed information on the current discharge volumes from each WwTW as well as detailed information on water quality parameters within all receiving watercourses. This information would allow a simulation of quality conditions that would need to be applied to the additional discharge in order for water quality targets to be maintained or reached. In turn, this would allow an assessment as to whether the quality conditions would be achievable within the limits of conventionally applied wastewater treatment technology. If they are, then a future solution would be considered possible; but if conditions would require treatment which is considered to be unconventional in order to meet water quality standards, a future solution may not be possible and alternative growth scenarios may need to be considered.

A modelling exercise of this scale was not possible within the scope of this study. Therefore, the simplified assessment was applied, appropriate to the detailed WCS, and follows an approach adopted in other WCS throughout the UK.

3.3 Sewer Network Assessment

The capacity of the existing sewer network is an important consideration for growth, as in some cases the existing system is already at, or over its design capacity. Further additions of foul and surface water from growth can result in sewer flooding in the system (affecting property or infrastructure) or can increase the frequency with which overflows to river systems occur, resulting in ecological impact and deterioration in water quality.

In this detailed WCS, an assumption has been applied that it is preferential from a cost and phasing perspective to use capacity within the existing sewer network first, before new sewers are built and commissioned.

NW have undertaken an internal assessment of the capacity of the existing sewer network system using unverified drainage area modelling and local operational knowledge. The NCC area is covered by 183 drainage areas, of which NW have 24 hydraulic models for the following major settlement areas:

- Acklington and Togston
- Allendale Town and Catton
- Alnwick
- Amble and Warkworth
- Bardon Mill
- Beadnell
- Belford
- Belford Industrial Estate
- Bellingham
- Berwick
- Blyth
- Cambois
- Cramlington
- Felton
- Haydon Bridge
- Hexham
- Lyneburn Valley
- Morpeth
- Newborough and Fourstones
- Prudhoe
- Rothbury
- Seahouses
- Seaton Valley
- Shilbottle

NW have a model of the Ponteland drainage area incorporated in a wider Newcastle model and are developing a model for the Newbiggin WwTW catchment area, including Ashington.

The models have been used by NW to assess the current and future performance of the public sewerage system, incorporating estimates of development up to 2020. Each length of public sewer assessed has been assigned a capacity factor based on its hydraulic performance and the likelihood of flow surcharging during a 1 in 20 year storm event (annual probability of 5%). Whilst this analysis is not indicative of associated property level flooding, it is indicative of potential capacity issues within the public sewerage system. Table 3-3 describes the capacity factor classifications from the drainage models and their impact on proposed development.

TABLE 3-3: SEWER NETWORK CAPACITY FACTORS		
Capacity Factor	**Predicted Water Level (output from NW drainage area model)**	**Comment**
5	Exceeds cover level	Development likely to exacerbate predicted hydraulic performance issue
4	Surcharged < 500mm below cover level	Development could create hydraulic performance issue
3	Surcharged > 500mm below cover level	Development unlikely to contribute to hydraulic performance issue
2	50% - 100% of soffit level	
1	<50% of soffit level	
-	Not modelled	Not modelled

NW have also identified which sites have water mains, sewers or both crossing the sites, which may need diversion or easement (to cross over existing NW assets) or where sites are close to existing sewage pumping stations (SPS).

3.4 Water Environment Assessment

It is vital that proposed development in Northumberland does not cause deterioration in current water quality and does not prevent the future achievement of WFD Good Status or Good Potential, Shellfish Waters Directive (SWD) and/or Bathing Water Directive (BWD) requirements in downstream waterbodies. Further details on the legislative drivers for the WCS are provided in Appendix A,

3.4.1 *Water Framework Directive*

The Environment Agency's 'Water Framework Directive – River Basin Management Plans – Rivers' Map[21] was used to identify the status of the receiving watercourses for each WwTW in the proposed settlement areas to ensure water quality is not compromised by additional discharges. The development must not cause the deterioration of current water quality and must not prevent the future attainment of WFD Good Status or Good Potential.

3.4.2 *Bathing Water and Shellfish Water*

Since the Outline WCS the European Council Shellfish Directive (79/923/EEC), stating the quality required of Shellfish Waters, has been repealed and replaced by the WFD (2000/60/EC). Under the WFD, shellfish waters are considered as protected areas.

Bathing water and shellfish water have been assessed by identifying the WwTWs that discharge into designated bathing water or shellfish waters. Only the WwTWs that have proposed development within their sewer drainage catchment under the Core Strategy have been assessed. The results from the WwTW Capacity assessment (Section 3.1) have been used to determine whether the WwTWs currently have limited capacity or no available capacity, therefore identifying which WwTWs are at potential risk of increased discharges from proposed development. The increased discharges may lead to deterioration in the water quality of the receiving waterbodies and impact on their compliance with the Bathing Water Directive or Shellfish WFD Standards.

[21] Water Framework Directive – River Basin Management Plans – Rivers Map http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=357683&y=355134&scale=1&layerGroups=default&ep=map&textonly=off&lang=_e&topic=wfd_rivers

3.5 Ecology Assessment

An ecology assessment is required for WwTWs that are assessed as having limited or no available capacity for the new development. Small WwTWs with descriptive consents were excluded from the assessment due to their size and therefore negligible impact.

There is limited ecological assessment that can be undertaken for the detailed Water Cycle Study since no River Quality Planning assessment has been undertaken. NW has commented that they would intend to do their own assessment once the scale and nature of development in a particular WwTW catchment was certain. As such it has not been possible to determine specifically what would be required for any of these WwTW, in terms of tightened Phosphorus (P) and (where appropriate) total Nitrogen (N) limits to achieve no deterioration downstream, or an improvement in water quality to raise WFD status. The ecology assessment has therefore been risk-based and involved an analysis of:

- which wastewater treatment works (if any) would need to increase their consented discharge volumes as a result of the new housing intended for the catchment;
- How these WwTW are situated regarding water flow and quality sensitive statutory designated wildlife sites (Special Area of Conservation, Special Protection Area, Ramsar site, Site of Special Scientific Interest, Marine Conservation Zone and Local Nature Reserve);
- What level of risk to the designated site is likely to be posed taking into account:
  - The current WFD Status of the receiving watercourse for the WwTW;
  - The vulnerabilities of the designated site;
  - The proximity and/or directness of connection between the WwTW and the designated site; and
  - The size of the WwTW in terms of DWF and thus the relative scale of its discharges relative to overall flows in the receiving watercourse.

In addition to designated sites, the WFD status of the receiving watercourse has also been taken into account in determining risk, irrespective of connections to statutory designated sites.

3.6 Water Resources Assessment

The NW Water Resource Management Plan 2014[22] (WRMP) and the updated Environment Agency Catchment Abstraction Management Strategies (CAMS) for the Tyne, Till and Northumberland Rivers catchments[23], published in February 2013, have been assessed to determine the available water resource in Northumberland and whether it can accommodate the demand from the proposed new growth.

The strategic water supply and infrastructure in NW's Kielder and Berwick and Fowberry Water Resource Zones (WRZ) has been reviewed to assess the feasibility of supplying water to the new growth areas.

[22] Northumbrian Water Limited, 2014. Final Water Resources Management Plan 2014. https://www.nwl.co.uk/_assets/documents/NW_Final_Published_PR14_WRMP_Report.pdf
[23] Environment Agency, 2013. Abstraction licensing strategies (CAMS process). https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process

3.7 Flood Risk and Surface Water Assessment

Fluvial and Tidal

The fluvial and tidal flood risk to each of the potential development area options has been assessed using the NCC Level 2 Strategic Flood Risk Assessment (SFRA). The SFRA used the Environment Agency Flood Risk for Planning (Rivers and Sea)[24] maps to assess the flood zone for each SHLAA site within the potential development area option.

Surface Water Flood Risk

The surface water flood risk to each of the potential development area options has been assessed using the NCC Level 2 Strategic Flood Risk Assessment (SFRA). The SFRA used the Environment Agency's updated Flood Risk from Surface Water Map (uFMfSW). Surface water flooding has only been reviewed on a potential development area option basis to provide an overview, as the uFMfSW cannot be used on an individual site basis due to the level of accuracy of the modelling.

Sustainable Drainage Systems (SuDS) constraints

Sustainable Drainage Systems (SuDS) techniques can be used to reduce the rate and volume and improve the water quality of surface water discharges from sites to the receiving environment (i.e. natural watercourse or public sewer etc.). Various SuDS techniques are available and operate on two main principles:

- Infiltration; and
- Attenuation prior to discharge to a waterbody.

All systems fall into one of these two categories, or a combination of the two.

SuDS designs should aim to reduce runoff by integrating storm water controls throughout the site in small, discrete units. Through effective control of runoff at source, the need for large flow attenuation and flow control structures should be minimised.

For the purpose of this study, two factors have been assessed to identify constraints on the use of SuDS methods for each potential development area option:

- The permeability of the underlying geology and soils (including superficial deposits and bedrock); and
- Source Protection Zones (SPZ).

The permeability of the superficial deposits and bedrock for each potential development area option has been assessed by SHLAA site in the NCC Level 2 SFRA. This data was based on the British Geological Survey (BGS) Superficial Permeability and Bedrock Permeability GIS layers, provided by NCC. There are five classes used to identify the permeability: very high, high, moderate, low and very low. The permeability assessment indicates the ability of water to flow through the unsaturated zone. For this WCS, the maximum permeability values for both superficial and bedrock were identified for each potential development area option, and where there was a difference between SHLAA sites within one potential development area option, the highest permeability was used. For potential development area options where both the permeability of the superficial deposits and bedrock is high, consideration of groundwater surface water interaction or connectivity will be required as part of the development as the ground could be free draining or allow groundwater to upwell.

[24] Environment Agency website http://maps.environment-agency.gov.uk/wiyby accessed 19th November 2014.

The SPZs for each potential development area option have been assessed using the Environment Agency's Groundwater Source Protection Zones map[25]. SPZs identify a risk of contamination to the groundwater source from activities that may cause pollution in the area. There are three defined zones:

SPZ 1 - 50 day travel time from any point below the water table to the source.

SPZ 2 - 400 day travel time from a point below the water table.

SPZ 3 - the area around a source within which all groundwater recharge is presumed to be discharged at the source.

For this detailed WCS, options for infiltration based SuDS are considered as potentially constrained if the development site is within SPZ 1 or the superficial permeability is low. The use of SuDS in these areas will potentially be limited to attenuation features, which are likely to require more surface area to provide the required attenuation volumes.

Developers will also need to consider the following constraints on the use of infiltration SuDS for individual development sites, with regards to pollution risk on controlled waters and groundwater levels:

- quality of the discharge, as there may be a risk of potential cross connections in the future and therefore whether long term management is required or not;
- increased risk of mobilising pollutants from within ground effected by land contamination and or previous polluting land uses;
- increased risk of polluting rivers from mine waters, by raising mine water levels, increasing gradients or changing flow paths resulting in new polluting discharges to rivers;
- areas where boulder clay predominates the drift geology:
  - Whilst sand and gravel lens are found within the clay they are often limited in extent and may have very limited capacity to store water. They have the potential to form pathways to the deep groundwater and may not provide the pollution attenuation required.
  - Clay holds a lot of water but becomes saturated slowly and subsequently releases it very slowly. Voids like sumps and foundations within the clay can fill over time if there is no drain or pump;
- areas of high groundwater levels, where there is the potential to induce local groundwater flooding, sewer/drainage flooding (from groundwater ingress);
- areas where there is on-going management of mine waters (undertaken by the Coal Authority) and risk of increasing the volumes requiring pumping and the associated management and operational costs to this pumping;
- areas where there is the potential to raise groundwater levels which will result in continued reduction in attenuation and hence the long term effectiveness of the SuDS. EU and Domestic legislation prohibits direct discharge of pollutants to groundwater; and
- areas where there is limited capacity to receive additional infiltration. This will require an assessment of the cumulative impacts of infiltration SuDS.

[25] Environment Agency website http://maps.environment-agency.gov.uk/wiyby

4 NORTHUMBERLAND WCS BASELINE AND ASSESSMENT OVERVIEW

For each aspect of the water cycle, this chapter summarises the results from previous Northumberland Outline WCS (2012)1, identifies any updates to the baseline data sources used for assessment since the outline study was published, and presents the results as an overview for the whole county. Detailed results for each settlement area are presented in Section 5 (New Development Area Assessments).

4.1 Wastewater Treatment and Collection Assessment

4.1.1 *Outcomes of the Outline WCS*

WwTW Capacity

The Outline WCS (May 2012) identified several WwTW across Northumberland that did not have capacity to accept or treat any further wastewater from the proposed development at that current time or in the near future:

- Allendale WwTW
- Alnwick WwTW
- Blyth WwTW
- Cramlington WwTW
- Haltwhistle WwTW
- Howdon STW
- Morpeth WwTW
- Rothbury WwTW
- Seahouses WwTW
- Wooler WwTW
- There are also known capacity issues at the some of the Coastal Village WwTW (Pegswood and Lynemouth)

Water Quality Consents

It is vital that proposed development in Northumberland does not cause deterioration in current water quality and does not prevent the future achievement of WFD Good Status or Good Potential, SWD requirements and/or BWD requirements in downstream waterbodies.

The following proposed development locations in the Outline WCS were considered to pose a risk to downstream watercourses/waterbodies based on how likely the WwTW is to exceed the current flow consent:

- Allendale
- Alnwick
- Ashington
- Blyth
- Cramlington
- Ellington
- Hadston
- Haltwhistle
- Lynemouth
- Morpeth
- Newbiggin-by-the-Sea
- Pegswood
- Ponteland
- Prudhoe
- Rest of Commuter Pressure Area
- Rest of Former Alnwick Area
- Rest of Former Berwick Area
- Rest of Former Castle Morpeth
- Rest of Rural Area - Tynedale
- Rothbury
- Seahouses
- Seaton Valley
- Wooler

Sewer Network

The Outline WCS identified sewer flooding incidents in the following areas across Northumberland, which could cause problems for further development if the existing infrastructure is not upgraded:

- South West Haltwhistle
- Central Alnwick
- North West Amble
- South Hadston
- South East Ashington
- North East Prudhoe
- North East Ponteland
- North and South Cramlington
- North West Blyth
- North East Hexham
- Central Bedlington
- East Bellingham
- North East of Haydon Bridge
- Several areas of South Morpeth

4.1.2 ***Updates to the Baseline WwTW assessment data***

Since the Outline WCS was produced, NW have carried out improvements and upgrades to the following WwTWs:

- Morpeth WwTW – NW have increased the capacity and have enough land available to construct an additional 2 filters.
- Wooler WwTW - NW have recently completed a scheme to remove surface water ingress/inflow from the sewer network upstream of the WwTW and will continue to monitor the impact of this upon the works performance. NW are not currently planning any expansion work on the plant during Asset Management Plan (AMP) 6 (the investment planning period 2015-2020).
- Howdon WwTW – NW are looking at opportunities for surface water separation from the foul and combined sewer network, which will free up capacity at the works for additional foul discharges. The works currently has headroom for approximately 13,000 homes.

NW have completed an unverified modelled sewer capacity assessment of their foul and surface water sewers, which has been used to assess the sewer network in this WCS.

4.1.3 ***WwTW Capacity Assessment Results***

NW have provided comments on the compliance of each WwTW to its current consent, comments relating to production, and an overall comment on the constraints of the WwTW to the proposed development. All NW's capacity assessments assume that no surface water will be discharged to WwTW. The headroom figures provided by NW relate to foul flows only. The NW overall WwTW capacity constraint assessment has been colour coded using a Red-Amber-Green (RAG) type assessment, as explained in in Table 4-1.

Table 4-2 presents the WwTW capacity assessment results for each WwTW by Delivery Area. It identifies which settlement areas (with proposed development) are within the drainage catchment and the current consented dry weather flow (DWF) for the WwTW. It should be noted that the Table 4-2 represents a snapshot in time. The capacity of WwTWs can be transient and headroom can be created and conversely taken away unexpectedly through operational issues. Similarly NW's planned investments are scheduled according to 5 year programmes and within each 5 year period of capital projects, the programmes are subject to on-going review to effectively prioritise investments according to a range of factors including demand.

Considering the points above NW are unable to commit to delivering upgrades to WwTWs at a specific year in the future due to phasing of development, however, NW will continue to invest in headroom as a requirement when development is confirmed, and this will be monitored through the NCC IDP. The IDP will be annually updated to reassess infrastructure capacity and needs. This review process will be critical to capture changes and will also be a key mechanism by which NCC, NW, the Environment Agency and other stakeholders will work collaboratively to appraise investment needs, overcome any capacity constraints and address environmental considerations.

TABLE 4-1: KEY FOR WASTEWATER NETWORK RAG ASSESSMENT

There are no capacity constraints to this WwTW	**There is limited capacity at the WwTW, however NW have identified potential actions to allow more headroom**	**There is no capacity at the WwTW and a solution has not yet been identified.**

TABLE 4-2: WWTW CAPACITY ASSESSMENT RESULTS SUMMARY

Delivery Area	WwTW	Settlement	Current Permitted DWF (m^3/d)	NW Current Capacity Assessment (situation as of September 2015)		
				Compliance Comments	Production Comments	Overall Capacity Constraints
North	Alnwick	Alnwick	3,322	-	800 units headroom	800 units headroom available, however when further development is certain NW will commence its investment procedure
	Belford	Belford	470	Compliant when upgrade complete	Compliant when upgrade complete	All planned development can be accommodated when scheme is complete estimated date for commissioning is March 2015
	Berwick upon Tweed	Berwick Scremerston	8100	Compliant	Compliant	
	Cornhill on Tweed	Cornhill on Tweed	N/A	No Capacity	No Capacity	Descriptive consent. No headroom for development at present. Potential need for upgrade
	Norham	Norham	163	Compliant	Compliant	
	Rothbury	Rothbury	512	No Capacity until upgraded	No Capacity until upgraded	When further development is certain NW will commence its investment procedure
	Seahouses	Seahouses	1,463	No Capacity	No Capacity	Investigations are to be planned into reasons for no headroom. When further development is certain NW will commence its investment procedure
	Wooler	Wooler	578	Limited Headroom	Limited Headroom	Surface water has been removed and this has created some headroom for foul flows from new development. More data is required from flow monitoring to confirm headroom more accurately.
	Whittingham	Whittingham	77	Compliant	Compliant	
	Glanton	Glanton	90	Compliant	Compliant	
Central	Broomhaugh	Corbridge Stocksfield	2,704	Compliant	Compliant	
	Heddon on the wall	Heddon on the wall	411	Compliant	Compliant	

TABLE 4-2: WWTW CAPACITY ASSESSMENT RESULTS SUMMARY

Delivery Area	WwTW	Settlement	Current Permitted DWF (m^3/d)	NW Current Capacity Assessment (situation as of September 2015)		
				Compliance Comments	Production Comments	Overall Capacity Constraints
	Hedley on the Hill	Hedley on the Hill	N/A	-	-	Descriptive consent. If growth is certain NW will commence its investment procedure
	Hepscott	Hepscott	142	No Capacity	No Capacity	No current plans to upgrade works however when development is certain NW will commence its investment procedure
	Hexham	Hexham	4,960	Compliant	Compliant	
		Acomb				
	Howdon	Prudhoe		Limited Headroom	Limited Headroom	Surface water removal schemes will be identified and prioritised for the foreseeable future
		Ponteland and Darras Hall				
		Wylam				
		Ovingham				
		Horsley				
		Mickley				
		Eltringham				
		Newcastle Airport				
		Seaton Valley[26]				
	Longhirst	Longhirst	N/A	Limited Headroom	Limited Headroom	Descriptive consent. If further development in excess of current headroom is certain NW will commence its investment procedure
	Longhorsley	Longhorsley	213	Compliant	Compliant	
	Morpeth	Morpeth	4,400	Compliant	Compliant	
	Pegswood	Pegswood	728	Compliant	Limited Headroom	If further development in excess of current headroom is certain NW will commence its investment procedure
	Scots Gap	Scots Gap	50	Limited Headroom	Limited Headroom	If further development in excess of current headroom is certain NW will commence its investment procedure
	Stannington St Mary's	Stannington Hospital	287	**Works has been abandoned and pumped to Cramlington**		
	Tranwell	Tranwell Wood	10	No Capacity	No Capacity	The works is a package plant located in a private garden and cannot be upgraded.
	Whalton	Whalton	95	Compliant	Compliant	
South East	Amble	Amble	2,512	Compliant	Compliant	
	Blyth	Blyth	11,664	Compliant	Compliant	
	Cambois	Bedlington	10,573	Compliant	Compliant	
		Guidpost Stakeford Choppington				
	Cramlington	Cramlington	9,600	Compliant	Compliant	
		Stannington[26]				
		Stannington Station[26]				

[26] This settlement is served by a WwTW outside of its delivery area

TABLE 4-2: WWTW CAPACITY ASSESSMENT RESULTS SUMMARY

Delivery Area	WwTW	Settlement	Current Permitted DWF (m^3/d)	NW Current Capacity Assessment (situation as of September 2015)		
				Compliance Comments	Production Comments	Overall Capacity Constraints
	Lynemouth	Lynemouth Ellington Widdrington Stobswood Hadston	3,030	Check infiltration	No capacity until infiltration removed	Surface water is entering the network resulting in no headroom for additional foul flows, source of infiltration has been identified and a remedial scheme designed. When further development is certain NW will commence its investment procedure
	New biggin	Ashington New biggin by the Sea	12,200	Check infiltration	No capacity until infiltration removed	Following the completion of the Drainage Area Study NW are investigating options for the removal of surface water from the sewerage system to reduce flood risk at the works. This means that in the short term NW may only be able to accept limited development.
West	Allendale	Allendale	324	Issue with ingress	Issue with ingress	Surface water is entering the network resulting in no capacity for additional foul flows. When further development is certain NW will commence its investment procedure
	Bardon Mill	Bardon Mill/ Redburn/ Henshaw	150	Compliant	Compliant	
	Barrasford	Barrasford	69	Limited Headroom	Limited Headroom	
	Bellingham	Bellingham	346	Compliant	Compliant	The CSO upstream of the works may cause a network issue.
	Birtley	Birtley	17	-	-	If growth is certain NW will commence its investment procedure
	Fourstones	Fourstones/ Newbrough	234	Compliant when flows from culvert removed	Compliant when flows from culvert removed	Surface water flows from a culvert are currently draining to the Ww TW, headroom will be available after the culvert is re routed
	Great Whittington	Great Whittington	N/A	-	-	Descriptive consent. If growth is certain NW will commence its investment procedure
	Gunnerton	Gunnerton	N/A	Compliant	Compliant	Descriptive consent.
	Haltwhistle	Haltwhistle	1,284	Limited Headroom	Limited Headroom	Surface water has been removed and this has created some headroom for foul flows from new development. More data is required from flow monitoring to confirm headroom more accurately.
	Haydon Bridge	Haydon Bridge	518	Check treatability	No capacity until infiltration removed	Surface water is entering the network resulting in no capacity for additional foul flows. When further development is certain NW will commence its investment
	Humshaugh	Humshaugh	130	No Capacity	No Capacity	The works currently has no headroom. No current plans to upgrade works however when development is certain NW will commence its investment procedure
	Wark	Wark	146	No Capacity	No Capacity	The works currently has no headroom. No current plans to upgrade works however when development is certain NW will commence its investment procedure

NW upgraded the following WwTWs during the previous Asset Management Plan (AMP) (2010-15):

- Morpeth – construction work was completed in December 2014 to deliver sufficient capacity for foul flows from 730 new homes and has been designed to be readily adapted to provide for greater housing numbers in future investment plan periods.
- Belford – This works has capacity to accept foul flows for development which has already commenced and a feasibility study is underway to identify the upgrade requirements for future development. The Belford upgrade is due for completion in March 2015.

NW have identified the potential need for upgrades of the following WwTWs during the current Asset Management Plan (AMP) 6 (2015-20):

- Rothbury – The works has headroom for foul flows for 55 new homes after which NW would accept no further flows until such time as the works is upgraded. A feasibility study is due to commence in 2015/16.
- Cornhill – The works has no headroom for development at present. A feasibility study is due to commence in 2015/16.
- Haltwhistle – NW has removed surface water from the works and this has created some headroom for foul flows from new development. Additional data is required from flow monitoring to confirm headroom more accurately.

NW are currently undertaking flows and loads investigations at the following WwTWs:

- Newbiggin – investigating the removal of surface water from the sewerage system to reduce flood risk to the works. This means in the short term that it may only be able to accept limited development.
- Wooler – NW has removed surface water from the works and this has created some headroom for foul flows from new development. Additional data is required from flow monitoring to confirm headroom more accurately.
- Seahouses (including Bamburgh and Beadnell) – NW are currently monitoring the flows at this works as flows are excessive.

Howdon WwTW has a large drainage catchment, serving all of the administrative area of Newcastle, South Tyneside and North Tyneside, as well as most of Gateshead and smaller proportions of southern Northumberland and northern Sunderland. Howdon WwTW is important for the settlement areas in the South East Delivery Area, such as Cramlington South West Sector, Seaton Delaval, New Hartley and Seghill. NW are currently working with the councils for Northumberland County, Newcastle, Gateshead, North and South Tyneside to agree a Memorandum of Understanding for flows which will ultimately discharge to this works. The removal of surface water from the combined sewerage system is key to making additional headroom available at Howdon to support growth across the five authorities.

NW have indicated that several WwTW (classed as amber in the RAG assessment) do not have capacity to accept further growth and that investigation to expand these works and determine a treatment solution would need to commence once further certainty of growth is forthcoming. For the purposes of this WCS, it is important to consider whether there are any potential constraints to a further solution in relation to water quality of the watercourses receiving the treated discharge from amber assessed WwTWs. A water quality consents assessment has therefore been undertaken to determine any water quality constraints.

4.1.4 ***Water Quality Consents Assessment Results***

Each of the consents to discharge for the WwTWs classified as 'red' or 'amber' for capacity were assessed in terms of their quality conditions, and the water quality condition for each discharge parameter compared to the value at which it is considered that further improvements cannot be achieved using conventionally applied treatment. For the purposes of this study, the limits of conventionally applied treatment processes are considered to be:

- 5mg/l for BOD;
- 1mg/l for Ammoniacal-N; and
- 1mg/l for Phosphate.

Where the conditions for a current discharge parameter can be reduced within the limits set out above, a solution is more likely to be feasible and for the purposes of this study, it has been concluded that a solution can be achieved. It should be noted that further detailed modelling would be required by NW (in conjunction with the Environment Agency) to determine the consent conditions required once the growth targets have been confirmed.

Table 4-3 shows a summary of the WwTW consents assessment. The receiving watercourses are those associated with the discharge of the WwTW.

TABLE 4-3: WWTW CONSENT ASSESSMENT RESULTS SUMMARY

Delivery Area	WwTW	Receiving Watercourse	Current Status	DWF (m^3/d)	BOD (mg/l)	Ammonia (NH3) (mg/l)	Phosphate (mg/l)	Overall Assessment
North	Alnwick	River Aln	Moderate	3,322	20	15	N/A	
	Cornhill on Tweed	River Tweed	Good	**Descriptive consent**				
	Rothbury	River Coquet	Moderate	512	25	N/A	N/A	
	Seahouses	North Sea	-	1,463	N/A	N/A	N/A	
	Wooler	Tributary of the River Till	Moderate	578	25	40	N/A	
Central	Heddon on the wall	River Tyne	Moderate	411	40	N/A	N/A	
	Hedley on the Hill	River Tyne	Moderate	**Descriptive consent**				
	Hepscott	Hepscott Burn	Poor	142	40	15	N/A	
	Howdon	River Tyne (tidal)	-	229,720	N/A	N/A	N/A	
	Longhirst	Longhirst Burn	Poor	**Descriptive consent**				
	Pegswood	Bothal Burn	Poor	728	25	7	N/A	
	Scots Gap	River Wansbeck	Poor	50	50	N/A	N/A	
	Stannington St Mary's	Duddo Burn	Good	**Works has been abandoned and pumped to Cramlington**				
	Stannington Station	Pegwhistle Burn	Poor					
	Tranwell	Hepscott Burn	Poor	**Descriptive consent**				
	Whalton	How Burn	Poor	95	25	N/A	N/A	
South East	Lynemouth	Lyn Estuary	Poor	3,030	40	/A	N/A	
	Newbiggin	North Sea	-	12,200	N/A	N/A	N/A	
West	Allendale	River East Allen	Moderate	324	25	10	N/A	
	Barrasford	River North Tyne	Moderate	69	40	30	N/A	

TABLE 4-3: WWTW CONSENT ASSESSMENT RESULTS SUMMARY

Delivery Area	WwTW	Receiving Watercourse	Current Status	DWF (m^3/d)	BOD (mg/l)	Ammonia (NH3) (mg/l)	Phosphate (mg/l)	Overall Assessment
	Birtley	Unnamed Tributary of the River North Tyne	-	17	N/A	N/A	N/A	
	Fourstones	River South Tyne	Moderate	234	40	20	N/A	
	Great Whittington	Bow bridge Burn	Good	**Descriptive consent**				
	Haltwhistle	Haltwhistle Burn	Poor	1,284	30	30	N/A	
	Haydon Bridge	River South Tyne	Moderate	518	33	N/A	N/A	
	Humshaugh	River North Tyne	Moderate	130	35	N/A	N/A	
	Wark	River North Tyne	Moderate	146	40	30	N/A	

Table 4-3 shows that all of the WwTW consents are greater than the conventionally applied treatment process limits. Therefore it is possible that the consents at these works can be constrained with tighter limits in the future and hence a solution is likely to be possible at these locations.

4.1.5 ***Sewer Network Assessment***

The detailed sewer network results are included in the site specific assessments in Section 5. It has been assumed that the new developments will require local connections to the existing drainage system, for which NW will need to be consulted on during or prior to the planning application, and that no surface water will be discharged to combined sewers.

Using the sewerage capacity factor (2020) outputs from the drainage models, NW have identified five scenarios resulting from the impact of development on the sewerage capacity factors and provided the following responses to the consequences:

Scenario 1: Any sites where the 2020 capacity factor (inclusive of development) is assessed as 1, 2 or 3

NW envisage no drainage issues associated with the development of the site subject to the developer complying with the assumed discharge points and run-off rates included within their modelling assessment.

Scenario 2: Previously developed sites where the 2020 capacity factor (inclusive of development) is assessed as 4 or 5

The redevelopment of previously developed land may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. This would involve diverting surface water flows that currently connect to a combined sewer system, to discharge into local watercourses by new off-site sewers.

For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim to a significant reduction in the surface water runoff rate from the site, using SuDS where possible.

Scenario 3: Greenfield sites where the 2020 capacity factor (inclusive of development) is assessed as 4 or 5.

NW envisage that the addition of new flows into sewers from greenfield development is likely to exacerbate any predicted hydraulic performance issues. NW would not be able to support immediate development of these sites as it would be contrary to the expected level of service. The level of service states that '*increased demands on the sewerage system should not put properties at risk of flooding from storm events with a return period less than 1 in 20 years*'.

For these sites further detailed analysis of the sewer network would be required to assess the scale of the improvements required to provide the additional capacity to support the development. In such cases the feasibility study, design and construction for such an upgrade would have to be concluded.

Given the projected housing growth across the region NW would require certainty that the development would be proceeding before the upgrade would be included in their capital programme.

Scenario 4: Major strategic development sites

The sewer capacity assessment has been carried out on a site by site basis, however the scale of the development in the following areas could require a cumulative assessment:

- Morpeth
- Ponteland
- Prudhoe
- Blyth, particularly in South Newsham; and
- Scremerston.

These 5 areas all have high concentrations of developments with limited surface water or foul water discharge points.

NW are currently working with NCC and developers in seeking to deliver a £2.4 million strategic sewer for north Morpeth which will connect flows from the Fairmoor area through HCA land and the St George's Hospital site direct to Morpeth WwTW. This will avoid the use of package WwTWs within the catchment and avoid any flows from development being discharged through the sewerage system within Morpeth town centre.

In South Newsham, Blyth, a developer has offered for adoption a 1.2km off site 375mm diameter surface water sewer to a watercourse.

For these areas NW would recommend that the requirement to consider an overall foul and surface water strategy for the cumulative impact of all these sites is built into the scope of a drainage master planning exercise. NW would be willing to support and contribute to this exercise.

Diversion/Easement and SPSs

NW have also identified which sites have water mains, sewers or both crossing the sites, which may need diversion or easement or where sites are close to existing sewage pumping stations (SPS). In some instances on previously developed land these are relics of the former development and can possibly be abandoned, however on many sites the assets serve a wider area and need to be maintained. For NW assets remaining in situ, development is limited by the standard easement widths, upon which no building can be constructed. Developers would need to consult NW with regards to existing assets, as this could be a limiting factor with regards to layout and scale of the development. Sewerage assets may be able to remain in place if the sewers have greater than 9m of cover, however this is subject to detailed consultations with NW and engineers.

In accordance with the nationally agreed 'Sewers for Adoption' – 6th edition, residential developments require a minimum distance of 15m from any SPS to limit the impact of noise and odour on future residents. NW have also identified sites which are unacceptably close to a WwTW and therefore they would object to the development. The detailed diversion/easement assessment is included in the settlement specific assessments in Section 5.

4.2 Water Environment

4.2.1 *Outcomes of the Outline WCS*

The Outline WCS (May 2012) identified that:

- Only ten waterbodies within Northumberland are predicted to achieve or remain at WFD Good Status or Good Potential by 2015. Development within Northumberland must not lead to a deterioration in water quality, nor prevent the achievement of good WFD water quality status. Where possible, opportunities to enhance water quality must be capitalised upon;

- Eleven of the thirteen Bathing Waters within Northumberland achieved the strict Guideline Bathing Water standards under the Bathing Water Directive (BWD) in 2011[27]; Spittal failed to achieve the Mandatory Standard and Low Newton failed to achieve the strict guideline standards for faecal streptococci.

- The Northumberland Coast has one designated Shellfish Water and the Environment Agency has produced the Holy Island Pollution Reduction Plan[28] to ensure that the designated water conforms to the SWD. The Holy Island Shellfish Water was compliant with all mandatory standards of the SWD for the period 2004 – 2008 but failed to achieve guideline standards in 2004 and 2007. In regards to the WCS, water discharges associated with new settlements must not lead to a deterioration of water quality in bathing or shellfish waters, especially in areas of poorer water quality as cumulative impacts may arise.

[27] Environment Agency (2011) Compliance Results for Bathing Waters in the UK http://maps.environment-agency.gov.uk/wiyby/wiybyController?latest=true&topic=coastalwaters&ep=query&lang=_e&x=425996.09375&y=606388.75&scale=7&layerGroups=1&queryWindowWidth=25&queryWindowHeight=25

[28] Environment Agency (2009) Directive (79/923/EEC) on the Quality Required of Shellfish Waters - Article 5 Programme Holy Island.

4.2.2 ***Updates to the Baseline Water Environment assessment data***

Water Framework Directive

The WFD has a number of clear deadlines for each of the stipulated requirements which member states must abide. Since the completion of the Outline Study in 2011 the issue of 'Making operational programmes of measures' deadline has passed. Article 11 of the Directive states that each member state should ensure the establishment for each river basin district, of a programme of measures in order to achieve the environmental objectives stipulated in Article 4. This has been achieved through the production of the Northumbria River Basin District River Basin Management Plan (RBMP)[29]. Additionally, Berwick-upon-Tweed falls into the Solway-Tweed RBMP produced by the Scottish Environment Protection Agency (SEPA). The Environment Agency has drafted updated versions of the RBMPs which were consulted on from October 2014 to April 2015 and due for publication in December 2015. SEPA is also updating RBMPs for Scottish waters which are due for publication in 2015. WFD water quality status assessments will be revised in December 2015 in line with the Environment Agency and SEPA's update of River Basin Management Plans.

Until the new RBMPs are published, the baseline data for WFD in Northumberland is the same as for the Outline WCS. Broadly, Northumberland is characterised by two distinctive environments. Generally the north and west of the County are higher quality environments wherein water quality is seen to be good or moderate as seen in the River Rede and Coquet respectively. This region also has areas of high water quality as seen by the Riddles Burn from the source to the River Coquet. Typically these rivers are unmodified and follow a more natural route. Assessment of the SEPA 2008 water quality classification map identifies the waterbodies within the Berwick-upon-Tweed areas as good and moderate such as Wheatland Burn and the River Tweed respectively.

To the south and east of the County the environment becomes more urbanised and waterbodies become increasingly modified and of moderate or poor overall status such as the River Tyne. The River Blyth watercourse to the tidal limit is also poor status, along with a number of the smaller 'Burn' watercourses in the County, such as Belford Burn, Hepscott Burn and Longhirst Burn.

For the surface waterbodies with a moderate or poor status, the overall objective is to have an overall status of good potential by either 2015 or 2027. Generally, rivers which achieved a poor result are subject to poor ecological and/or chemical quality indicators, and are typically teamed with poor biological diversity, as seen in Bothal Burn (a tributary of the River Wansbeck). Coastal waters were identified as having good water quality.

Under the WFD, development must not cause the deterioration of current groundwater body status and should progressively reduce the pollution of groundwater. There are four WFD Groundwater Bodies within the NCC administration boundary, three of which were assessed as Poor status in the Northumbria RBMP 2009[29] due to poor chemical status (Table 4-4). The poor chemical status relates to the historic mining activities in the area and can impact on surface water quality where the groundwater and surface water interact. The groundwater bodies are designated as drinking water protected areas.

[29] Northumbria River Basin District River Basin Management Plan (2009). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/297473/gene0910bsrv-e-e.pdf

TABLE 4-4: WFD GROUNDWATER BODY STATUS[29]		
Waterbody ID	**Waterbody Name**	**Current Overall Status (2009)**
GB40302G702700	Tyne Carboniferous Limestone	Poor
GB40302G703800	Northumberland Devonian and Lower Carboniferous	Good
GB40302G701500	Tyne Carboniferous Limestone and Coal Measures	Poor
GB40302G700200	Northumberland Carboniferous Limestone and Coal Measures	Poor

Groundwater levels, groundwater /surface water interactions, climatic conditions can all impact the groundwater bodies and should be considered for the potential developments area options. Groundwater surface water interaction or connectivity will need to be considered where both the permeability of the superficial deposits and bedrock is high, as the ground could be free draining or allow groundwater to upwell. High or perched groundwater levels can impact and reduce sewer capacity due to ingress into network.

Shellfish Waters

Since the Outline WCS the European Council Directive (79/923/EEC), stating the quality required of shellfish waters, has been repealed and replaced by the WFD (2000/60/EC). Under the WFD, shellfish waters are considered as protected areas. The standards for assessment are very similar but have been updated to measure Escherichia.coli (E.coli). E.coli is a type of bacteria found the intestines of humans and animals, therefore the presence of the bacteria in shellfish and bathing waters indicates that untreated sewerage may be present.

In 2013, shellfish samples screened for paralytic shellfish poisoning (PSP) toxins in the vicinity of Holy Island were found to be positive[30]. One Pacific Oyster at Holy Island exceeded the Maximum Permitted Levels of such toxins.

Similarly, five Holy Island samples tested positive for Azaspiracid (marine biotoxin) groups. Whilst none of the samples breached the Maximum Permitted Levels of such toxins, Holy Island had the highest level of this biotoxin in England and Wales during the 2013 assessment.

As of September 2014, The Holy Island Production Area was rated as Class B. A category B classification means that shellfish must be treated before they can be sold for human consumption as a function of their Escherichia coli content.

Bathing Waters

As of 2015, bathing water quality assessments will be undertaken using stricter guidelines under the revised Bathing Water Directive (2006/7/EC). The revised Bathing Water Directive states that: ‘water is a scarce natural resource, the quality of which should be protected, defended, managed and treated as such’. For the detailed WCS this means that development should not be located where bathing water quality may be compromised, however, where it is unavoidable, adequate treatment of any discharges or surface water runoff must be undertaken. Opportunities to enhance water quality should be taken at every eventuality through the implementation of SuDS, for example.

[30] In 2013, the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and their partner DEFRA released the Annual report on the results of the Biotoxin and Phytoplankton Official Control Monitoring Programmes for England and Wales.

In 2014, eleven of the thirteen bathing waters in Northumberland achieved a 'higher' standard[31], i.e. they met the criteria for the stricter UK guideline standards of the Bathing Water Directive. Spittal and Seaton Sluice Beaches achieved the minimum standard. In the interim period between the outline and detailed WCS, both Seaton Sluice and Spittal failed bathing water quality assessments in 2012 whilst Blyth South Beach and Druridge Bay North only achieved 'minimum' requirements in the same year, due to high Escherichia coli colonies within the Northumberland waterbodies.

4.2.3 *Water Environment Assessment results*

Eight WwTWs were identified as discharging into one of the thirteen designated bathing waters in Northumberland. However, the proposed development in the Core Strategy will only impact on five of these WwTWs. The WwTW capacity assessment (Table 4-2) has been used to identify the WwTWs discharging to designated bathing waters that currently have limited capacity (Amber) or no capacity (Red).

Table 4-5 shows that four of the bathing waters in Northumberland are at potential risk of increased discharges from proposed development in the sewer drainage catchments for Seahouses and Newbiggin WwTWs. This has the potential to contribute to deterioration in the water quality of the discharges at these sites, and impact on their compliance with the Bathing Water Directive Standards, due to increased discharge volumes. However, it is likely that improvements to the WwTWs would be feasible through improved tertiary treatment, such as UV treatment, or reducing discharges from combined sewer outflows. When growth is certain at these sites, NW will commence its investment procedure.

TABLE 4-5: WWTW CONSENT ASSESSMENT RESULTS SUMMARY

Designated Bathing Water Site	WwTW	WwTW capacity RAG
Seahouses North	Seahouses	
Beadnell		
New biggin North	New biggin	
New biggin South		

No development is proposed in the Core Strategy for Holy Island or the WwTWs discharging to waters that could impact on the designated shellfish waters. Therefore, the proposed development in the Core Strategy is not considered to cause deterioration of the water quality within the designated shellfish waters.

4.3 Ecology and Biodiversity

4.3.1 *Outcomes of the Outline WCS*

The Outline WCS (May 2012) identified designated sites (SSSIs and internationally important wildlife sites) that have the potential to be affected by the increase or likely increase in flow required at a WwTW (above consented conditions) due to the proposed development. A summary of the potential impacts of increased WwTW discharges on the local ecology is set out in Table 4-6.

Although Table 4-6 has not been altered (since it summarises the conclusion of an earlier report) it should be noted that for the detailed WCS the judgments of linkage have been updated to reflect further consideration of the vulnerabilities of some designated sites, such as the Northumbria Coast SPA, Coquet Island SPA/SSSI and the Farne Islands SPA/SSSI.

[31] Further details on the assessment of Northumberland Bathing Waters from 2012-2014 are available on http://environment.data.gov.uk/bwq/explorer/index.html

Although parts of the Northumbria Coast outside the Northumbria Coast SPA (specifically Budle Bay and enclosed bays around Holy Island) are affected by smothering macroalgae (Ulva sp.), the growth of which can be stimulated by increased nitrogen from treated sewage effluent, in the open coast within this SPA there is no similar problem and the breeding/migratory wader populations of the SPA are likely to benefit from increased mudflat invertebrate biomass. Overall therefore it is considered that increased treated sewage effluent discharge would not result in an adverse effect on the SPA.

A similar conclusion is also made concerning Coquet Island SPA/SSSI and Farne Islands SPA/SSSI. An update has been made to reflect potential impacts of Wooler WwTW on Lindisfarne SPA/Ramsar site/SSSI and the low risk of impact on this site from Seahouses and Alnwick WwTW given the strong southward action of longshore drift on this coast.

TABLE 4-6: OUTLINE WCS ECOLOGY SUMMARY

Designated Site	WwTW that pose a risk to the designated site
Berwickshire and North Northumberland Coast SAC	Seahouses Ww TW Wooler Ww TW Alnwick Ww TW.
Northumbria Coast SPA	Morpeth Ww TW Rothbury Ww TW Seahouses Ww TW Alnwick Ww TW Blyth Ww TW Cramlington Ww TW Shilbottle Ww TW Pegswood Ww TW Lynemouth Ww TW
The River Tweed SAC/SSSI and the Tweed Estuary SAC/SSSI	Wooler Ww TW
Lindisfarne SPA/Ramsar/SSSI	Seahouses Ww TW Alnwick Ww TW.
Coquet Island SPA	Rothbury Ww TW Seahouses Ww TW Alnwick Ww TW Shilbottle Ww TW
The Farne Islands SPA	Seahouses Ww TW Alnwick Ww TW Shilbottle Ww TW

There are a range of SSSIs which may receive discharge volumes in excess of that currently consented. Unlike internationally important sites, there is no background analysis available through the RoC process for these SSSIs specifically, so it must be assumed that impacts on these sites cannot be dismissed. Non-statutory wildlife sites were not covered in the Outline WCS and are therefore not discussed in Table 4-6. However, they have been considered in this detailed WCS.

Within Northumberland there is also one confirmed Marine Conservation Zone (MCZ) at the Aln Estuary and two proposed MCZs, which were out to consultation in Spring 2015: Coquet to St Mary's MCZ and Farnes East MCZ. Impacts on all of these sites require consideration in line with the provisions of the Marine and Coastal Access Act 2009. Two of the three MCZs are located downstream of WwTWs that will need to exceed consented discharge volumes to accommodate proposed development.

4.3.2 ***Updates to the Baseline ecology assessment data***

For the detailed WCS the list of designated sites was revised and a lower tier of statutory wildlife sites was included, namely Local Nature Reserves. A tier of non-statutory wildlife sites was also included and two specific relevant conservation matters outside designated site boundaries were included:

- the presence of freshwater pearl mussel on the North Tyne; and
- the presence of a large white-clawed crayfish population throughout the Wansbeck catchment.

The detailed WCS has narrowed down the list of WwTWs requiring consideration. Those WwTWs that would be able to meet the requirements of expected new housing without seeking an increase in their consented discharge volumes have been removed from ecological consideration on the basis that they will therefore continue to comply with their current permits, which have already been assessed by the Environment Agency for environmental acceptability.

This process leaves sixteen WwTW that would require an increase in their consented discharge volumes. If the increase in consented discharge volumes were not able to be achieved without deterioration in downstream water quality, this could result in an adverse effect on downstream designated sites, depending on other factors such as sensitivity and proximity. All sixteen of these watercourses have a hydrological connection (albeit sometimes at considerable distance) to designated wildlife sites.

4.3.3 ***Ecology Assessment Results***

The results of the high-level ecological analysis are presented in Table 4-7.

TABLE 4-7: WWTW AND RELATED DESIGNATED WILDLIFE SITES

Delivery Area	WwTW	Receiving watercourse	Downstream designated wildlife sites (statutory and non-statutory)	Risk of impact
North	Alnwick	River Aln	This WwTW is located 8km upstream of a collection of coastal sites: Alnmouth Saltmarsh and Dunes SSSI, North Northumberland Dunes SAC, Northumberland Shore SSSI. Berwickshire and North Northumberland Coast SAC, Northumbria Coast SPA and the non-statutory Alnmouth to Amble Coast site. Also on the coast are Lindisfarne SPA/Ramsar/SSSI/NNR and some way offshore are Coquet Island SPA and the Farne Islands SPA. The Aln Estuary MCZ also lies at the mouth of the River Aln.	North Northumberland Dunes SAC does not contain any features that would be sensitive to water quality impacts from increased discharge of treated sewage effluent. For reasons discussed in section 4.3.1 Northumbria Coast SPA is not considered susceptible to negative effects through the pathway of increased discharge of treated sewage effluent. The Northumberland Shore SSSI consists largely of sandy bays separated by rocky headlands with wave-cut platforms, backed by dunes or soft and hard cliffs. As such, its susceptibility to high nitrogen loading is limited. Coquet Island and the Farne Islands are unlikely to be affected due to their distance from the coast and in particular the strong southward action of longshore drift on the coast. Alnwick is the largest WwTW that may need to seek an increase in its consented discharge volumes. The WwTW is classified as **medium risk** since Alnmouth Saltmarsh & Dunes SSSI, Aln Estuary Marine Conservation Zone, Berwickshire and North Northumberland Coast SAC and the Lindisfarne designated sites are all downstream and are water quality sensitive. However, nitrogen inputs are likely to be dominated by marine sources, the WwTW is 8km upstream of the nearest site and there is strong southward action of longshore drift on this coast such that substantial dilution is likely to occur.
	Rothbury	River Coquet	Discharges into the River Coquet and Coquet Valley Woodlands SSSI. Ultimately (after c. 40km) this river discharges close to the Warkworth Dunes and Saltmarsh SSSI, North Northumberland Dunes SAC, Amble Dunes LNR, Northumbria Coast SPA and the non-statutory Alnmouth to Amble Coast site. The Coquet to St Mary's MCZ also lies at the mouth of the River Coquet. Also on the coast are Lindisfarne SPA/Ramsar/SSSI/NNR and some way offshore are Coquet Island SPA and the Farne Islands SPA.	WwTW classified as **high risk** because the WwTW discharges directly into a water quality sensitive SSSI (River Coquet & Coquet Valley Woodlands SSSI). Some parts of the River Coquet have historic water quality issues due to diffuse pollution. Lindisfarne designated site (known to be affected by high water column nitrate concentrations) and the Coquet to St Mary's MCZ are also downstream of the WwTW, although sufficiently far (over 40km) that very substantial dilution is likely to occur. Coquet Island SPA and Farne Islands SPA are even further downstream and dilution is therefore likely to be very large.
	Seahouses	North Sea	Discharges directly into Northumbria Coast SPA/Ramsar site and Berwickshire and North Northumberland Coast SAC	For reasons discussed in section 4.3.1 Northumbria Coast SPA is not considered susceptible to negative effects through the pathway of increased discharge of treated sewage effluent. Although some parts of Berwickshire & North Northumberland Coast SAC are affected by eutrophication and macro-algal growth, these areas are north of the Seahouses discharge. The open coast south of Seahouses has strong southward longshore drift which will assist in flushing. As such, this WwTW is accorded **low risk**, despite discharging into an SAC/SPA/Ramsar site.

TABLE 4-7: WWTW AND RELATED DESIGNATED WILDLIFE SITES

Delivery Area	WwTW	Receiving watercourse	Downstream designated wildlife sites (statutory and non-statutory)	Risk of impact
	Wooler	Tributary of the River Till	The River Till, immediately downstream is covered by the 'River Tweed SAC' and 'Tweed Catchment Rivers: England SSSI' designations. Till Riverbank SSSI is downstream. Tweed Catchment Rivers: Lower Tweed and Whiteadder SSSI are even further downstream and ultimately Tweed Estuary SAC, Berwickshire and North Northumberland Coast SAC, Northumberland Shore SSSI, Northumbria Coast Ramsar site, and Lindisfarne SSSI/SPA/Ramsar site/NNR.	WwTW classified as **high risk** because the WwTW discharges a short distance upstream of the Till Riverbank SSSI, River Tweed SAC and Tweed Catchment Rivers: Lower Tweed & Whiteadder SSSI. All three sites have significant water quality constraints due to high existing phosphate levels. The River Till is in unfavourable declining condition. According to the Natural England condition assessment for this SSSI water quality data from the Environment Agency indicates that the P level downstream of the WwTW outfall are above the levels set out in the Favourable Condition Tables. This is most likely to be due to the discharge from the STW given that the P levels sampled just above the outflow are very low and meeting the target. As such this WwTW is considered particularly constrained in terms of the potential for increase discharge volume and the need to achieve improved water quality Tweed Estuary SAC, Berwickshire and North Northumberland Coast SAC and Lindisfarne designated site are also downstream of the WwTW at the mouth of the River Tweed, These sites are already affected by smothering macro-algal growth due to eutrophication, particularly at Budle Bay, and have poorly flushed enclosed bays. However, these are sufficiently far (over 50km in the case of Lindisfarne) that, considerable dilution of effluent will take place. In addition, Lindisfarne SSSI/SPA/Ramsar site/NNR and Berwickshire & North Northumberland Coast SAC are these designated sites could be further affected by any increase in treated sewage effluent unless nitrogen removal to an improved standard was possible.
Central	Heddon on the Wall	River Tyne	Ryton Willows SSSI is less than 2km downstream but is not hydrologically connected to the river. The river ultimately drains into the Northumbria Coast Ramsar site and Northumberland Shore SSSI, Tynemouth to Seaton Sluice SSSI and Durham Coast SSSI but these are over 30km downstream.	A number of the designated wildlife sites downstream are water quality sensitive, particularly regarding nitrogen loading, but nitrogen inputs are likely to be dominated by marine sources. Moreover, the WwTW is a considerable distance from the nearest designated wildlife site such that substantial dilution of any treated effluent will occur. A more detailed assessment would be required but it is considered that any water quality issues are likely to be avoidable/ solvable and therefore it is accorded **low risk** compared to others in this table.
	Hepscott	Hepscott Burn	Willow Burn Pasture SSSI is less than 2km downstream, immediately followed by Choppington Community Woods LNR, with Sleekburn Fen 4km downstream and ultimately the Blyth Estuary and Northumberland Shore SSSI. Although the Burn is not listed as a key interest habitat for the SSSI, the wetter parts of the grassland and fen which may be connected to the burn are listed.	Although there may be a hydrological connection between the river and Willow Burn Pasture SSSI, this is not a flood meadow and it is unlikely that water quality in the river has a significant influence on the nutrient status (and therefore ecological condition) of the SSSI. However, the receiving watercourse already has known water quality problems linked to point source and diffuse pollution sources and additional loading could exacerbate these problems. In addition to this fens are nutrient limited habitats and therefore highly sensitive to increase nitrogen and phosphorous inputs. For this reason, Hepscott is considered **medium risk**, pending more detailed studies by NW.

TABLE 4-7: WWTW AND RELATED DESIGNATED WILDLIFE SITES

Delivery Area	WwTW	Receiving watercourse	Downstream designated wildlife sites (statutory and non-statutory)	Risk of impact
	Pegswood	Bothal Burn	After approximately 1km treated effluent flows through the non-statutory Bothal Burn and River Wansbeck site and then Wansbeck Riverside Park LNR and Castle Island LNR, ultimately draining into the Wansbeck Estuary and Northumberland Shore SSSI.	None of the LNRs are likely to be significantly affected by changed in water qualities or flow, except in broad terms. The SSSI and Wansbeck Estuary saltmarsh will be susceptible to nitrogen loadings, although these are likely to be dominated by marine sources. This WwTW is around 6km from Wansbeck Estuary and over 10km from the coastal sites so dilution will take place. However, the River Wansbeck and its tributaries is situated closer to Pegswood WwTW and contains probably the largest remaining white-clawed crayfish population in the UK. White-clawed crayfish are very sensitive to poor water quality as a result of eutrophication. The Bothal Burn and River Wansbeck site is designated for white-clawed crayfish and is only 1 km from Pegswood WwTW. Moreover, the water quality assessment has already identified that further improvements to discharge quality from Pegswood may not be possible within the limits of conventionally applied treatment and hence this WwTW is considered **medium risk** (since no designated sites are involved), pending more detailed studies by NW.
	Scots Gap	River Wansbeck	The receiving watercourse flows through the edge of Wansbeck and Hartburn Woods, Borough Woods LNR and Scotch Gill Wood LNR, Wansbeck Riverside Park LNR and Castle Island LNR, ultimately draining into Wansbeck Estuary and Northumberland Shore SSSI.	None of the LNRs is likely to be significantly affected by changes in water quality or flows, except in broad terms. The Northumberland Shore SSSI consists largely of sandy bays separated by rocky headlands with wave-cut platforms, backed by dunes or soft and hard cliffs. As such, its susceptibility to high nitrogen loading is limited. Moreover, this WwTW is 13-26km from these sites so considerable dilution will take place. Wansbeck and Hartburn Woods are situated 8 km downstream of Scots Gap and are designated for white-clawed crayfish. The River Wansbeck and its tributaries are also situated close to Scots Gap WwTW. These contain probably the largest remaining white-clawed crayfish population in the UK. White-clawed crayfish are very sensitive to poor water quality as a result of eutrophication. Moreover, the receiving watercourse already has known water quality problems linked to point source and diffuse pollution sources and additional loading could exacerbate these problems. For this reason, Scots Gap is considered **medium risk** (since no designated sites are involved), pending more detailed studies by NW.
	Whalton	How Burn	How Burn connects to Bedlington Country Park and Hapenny Woods LNRs Pegwhistle Fen, the Blyth and Pont River site and ultimately drains close to the Blyth Estuary, Northumberland Shore SSSI, Northumbria Coast SPA and Blyth to Seaton Sluice Dunes LNR. However, the WwTW is between 8-27km from these sites.	The Blyth and Pont Rivers are designated for white-clawed crayfish which are sensitive to poor water quality as a result of eutrophication; this site is only 8 km downstream of Whalton WwTW. Pegwhistle fen approximately 13 km downstream and borders the river, the fen is also sensitive to nitrogen pollution. Impacts on designated sites can probably be avoided given the distances involved. However, the receiving watercourse already has known water quality problems linked to point source and diffuse pollution sources and additional loading could exacerbate these problems. For this reason, Whalton is considered **high risk**, pending more detailed studies by NW.

TABLE 4-7: WWTW AND RELATED DESIGNATED WILDLIFE SITES

Delivery Area	WwTW	Receiving watercourse	Downstream designated wildlife sites (statutory and non-statutory)	Risk of impact
South East	Lynemouth	North Sea	Discharges approximately 1.5km north of Northumbria Coast SPA/Ramsar site.	For reasons discussed in section 4.3.1 Northumbria Coast SPA is not considered susceptible to negative effects through the pathway of increased discharge of treated sewage effluent. The open coast south of Seahouses has strong southward longshore drift which will assist in flushing. As such, this WwTW is accorded **low risk**.
	Newbiggin	North Sea	Discharges directly into Northumbria Coast SPA/Ramsar site	For reasons discussed in section 4.3.1 Northumbria Coast SPA is not considered susceptible to negative effects through the pathway of increased discharge of treated sewage effluent. The open coast south of Seahouses has strong southward longshore drift which will assist in flushing. As such, this WwTW is accorded **low risk**, despite discharging into an SPA/Ramsar site.
West	Allendale	River East Allen	The WwTW discharges approximately 5km upstream of Allen Confluence Gravels SSSI and Stawardpeel Woods SSSI and not much further upstream from Briar Wood Banks SSSI. The river gravels at the Allen Confluence support an outstanding assemblage of river margin invertebrates. This fauna is characteristic of riverine sand and shingle and is especially important because of the wide range of habitats present. These include consolidated sand and shingle that is land which is only occasionally inundated and on the whole well vegetated, together with partially vegetated often unstable sand banks and shingle ridges which are subject to regular flooding. It discharges 24km upstream from Tyne & Allen River Gravels SAC.	Neither Stawardpeel Woods SSSI (which is designated for its species-rich dry woodlands and dormice) nor Briar Wood Banks SSSI (designated for its species-rich dry woodlands) are likely to be affected by water quality in the River East Allen. Impacts on Tyne & Allen River Gravels SAC can probably be avoided given the distances involved and the fact that the metalliferous nature of the substrate may counteract any nutrient inputs from the river in terms of retarding development of scrubbier growth. Further investigation would be required into potential for impacts on Allen Confluence Gravels SSSI but it is probable that any water quality issues are likely to be avoidable/ solvable and therefore it is accorded **low risk** compared to others in this table.
	Barrasford	River North Tyne	The WwTW is situated within the non-statutory site Tyne River North – Wark to Chollerford. It is approximately 8km north of Tyne Watersmeet SSSI and Howford Bank. The non-statutory sites are designated for freshwater pearl mussels. The SSSI includes a periodically flooded riverside rock outcrop which supports an unusual ground flora assemblage beneath a variety of willow shrubs.	Freshwater pearl mussels are highly sensitive to water pollution; even low levels can cause a detrimental effect to juvenile to adult recruitment levels. In addition to Barrasford, the Wark and Humshaugh WwTW sites are also located within the Tyne River North – Wark to Chollerford non-statutory site (to the north and south of Barrasford respectively) which will significantly increase the overall loading of treated effluent discharged to this section of the river. The River North Tyne is a stronghold for the Northumbrian population of freshwater pearl mussel (Northumberland being one of the two main areas for this species in England) and the WwTW discharges directly into a non-statutory site designated for the species. The WwTW is therefore classified as **high risk**.

TABLE 4-7: WWTW AND RELATED DESIGNATED WILDLIFE SITES

Delivery Area	WwTW	Receiving watercourse	Downstream designated wildlife sites (statutory and non-statutory)	Risk of impact
	Fourstones	River South Tyne	WwTW discharges immediately upstream of Tyne & Allen River Gravels SAC.	The Tyne & Allen River Gravels SAC may not be particularly susceptible to riverine water quality if it is no longer heavily dependent on flooding and given that the metalliferous nature of the substrate may counteract any nutrient inputs from the river in terms of retarding development of scrubbier growth. However, given the very close proximity of the WwTW to the SAC, it is considered that further investigation would be required into potential for impacts and it is accorded **medium risk** compared to others in this table.
	Haltwhistle	Haltwhistle Burn	The burn drains directly into the River South Tyne. Beltingham River Shingle SSSI is 8km downstream. Further downstream is the Tyne & Allen River Gravels SAC, Wharmsley Riverside SSSI, Tyne Watersmeet SSSI and the designated sites at the mouth of the River Tyne. However, the closest of these is 20km downstream of the WwTW, with the furthest being 60km downstream.	The metalliferous nature of the substrate at Beltingham River Shingle SSSI probably outweighs the influence of nutrient build up from the river, if indeed inundation still occurs. Coupled with the considerable separating distance (8km) it is considered probable that impacts on the SSSI can be avoided. Impacts on other designated sites can probably be avoided given the distances involved. However, the receiving watercourse already has poor WFD status, which would impose considerable constraints on further effluent discharge. For this reason, Haltwhistle is considered **medium risk** (since no designated sites are involved), pending more detailed studies by NW.
	Haydon Bridge	River South Tyne	WwTW discharges 6.5km upstream of Tyne & Allen River Gravels SAC.	Impacts on Tyne & Allen River Gravels SAC can probably be avoided given the distances involved and the fact that the metalliferous nature of the substrate may counteract any nutrient inputs from the river in terms of retarding development of scrubbier growth. Further investigation would be required into potential for impacts but it is probable that any water quality issues are likely to be avoidable/ solvable and therefore it is accorded **low risk** compared to others in this table.
	Humshaugh	River North Tyne	WwTW discharges directly into the non-statutory Tyne River North – Wark to Chollerford designated site. It is 4.5km upstream of Tyne Watersmeet SSSI	Impacts on statutory designated sites can probably be avoided given the distances involved. However, freshwater pearl mussels are highly sensitive to water pollution; even low levels can cause a detrimental effect to juvenile to adult recruitment levels. In addition to Humshaugh, the Wark and Barrasford WwTW sites are also located within the Tyne River North – Wark to Chollerford non-statutory site, which will significantly increase the overall loading of treated effluent discharged to this section of the river. The River North Tyne is a stronghold for the Northumbrian population of freshwater pearl mussel (Northumberland being one of the two main areas for this species in England) and the WwTW discharges directly into a non-statutory site designated for the species. The WwTW is therefore classified as **high risk**

TABLE 4-7: WWTW AND RELATED DESIGNATED WILDLIFE SITES

Delivery Area	WwTW	Receiving watercourse	Downstream designated wildlife sites (statutory and non-statutory)	Risk of impact
	Wark	River North Tyne	WwTW discharges directly into the non-statutory Tyne River North – Wark to Chollerford designated site. It is 17km upstream of Tyne Watersmeet SSSI.	Impacts on statutory designated sites can probably be avoided given the distances involved. However, freshwater pearl mussels are highly sensitive to water pollution; even low levels can cause a detrimental effect to juvenile to adult recruitment levels. In addition to Wark, the Humshaugh and Barrasford WwTW sites are also located within the Tyne River North – Wark to Chollerford non-statutory site, which will significantly increase the overall loading of treated effluent discharged to this section of the river. The River North Tyne is a stronghold for the Northumbrian population of freshwater pearl mussel (Northumberland being one of the two main areas for this species in England) and the WwTW discharges directly into a non-statutory site designated for the species. The WwTW is therefore classified as **high risk**

4.4 Water Resources and Supply

4.4.1 *Outcomes of the Outline WCS (May 2012)*

Based on the water availability datasets and proposed development at the time of the assessment, the Outline WCS (May 2012) determined that there were adequate existing water resources to supply the new development within the Kielder Water Resource Zone (WRZ), however Berwick and Fowberry WRZ was unable to meet demand under exceptional circumstances. At the time the Outline WCS was produced, NW were completing work to help improve resilience in supply in the Berwick and Fowberry WRZ by installing improved aquifer monitoring equipment in the area and scoping a feasibility study for a project to assess water production within current licence conditions via new infrastructure between networks.

Other key water resources and supply outcomes from the Outline WCS (May 2012):

- Most of the river catchments in NCC are classified by the EA as having some 'Water Available', however the River Coquet (upper and lower) and River Font both have water resources issues at certain times of year,
- The Kielder WRZ has a large volume of spare licence quantity due to the decline in heavy industries in the North East which have reduced water demands in this area,
- The total additional demand for water in Northumberland post development would range from 12.8 Mld^{-1} and 20.5 Mld^{-1}, which equates to between 8% and 13% of NWs current total surplus,
- NW's 2009 WRMP shows that after the proposed schemes are in place, there is a comfortable surplus of water supplies over demand for water for the next 25 years in all of its water resource zones and under all forecast conditions, and
- Careful consideration should be given to the siting of development in areas where the water supply is abstracted from groundwater sources, to ensure the adequate protection of existing abstraction sources.

4.4.2 *Updates to the Baseline Water Resources and Supply assessment data*

Since the Outline WCS was produced in 2012, the following documents have been updated:

- The Environment Agency CAMS process for water availability for abstraction was updated in February 2013. The results of this update are similar to those previously described in the Outline WCS, with the majority or the areas classed as 'Water available for licensing' during low flows (Q95). Therefore the process of describing catchment resources is not repeated in this WCS update.
- In August 2014, NW published their final Water Resource Management Plan 2014[32] (WRMP), which covers the planning period 2015-2040 and uses a baseline position of 2012/13. A review of the WRMP is detailed below.

[32] Northumbrian Water Limited, 2014. Final Water Resources Management Plan 2014. https://www.nwl.co.uk/_assets/documents/NW_Final_Published_PR14_WRMP_Report.pdf

Northumbrian Water Limited's WRMP 2014

Kielder WRZ

NW's WRMP 2014 states that there have been no major changes to abstraction licenses or treatment works capacities in the Kielder WRZ over the recent planning period, therefore the deployable output for this WRZ has not changed from the data used to inform the Outline WCS. Kielder WRZ, which supplies water to approximately 99% of NW's supply area customers, is classed as not seriously water stressed and predicted to be in surplus of 150Ml/d by 2040, based on existing growth projections.

The Kielder WRZ relies on the Kielder Reservoir, to support surface water resources. Releases from Kielder Reservoir are strategically used to augment river flows and maintain other reservoir levels in times of drought to meet demand. The Tyne – Tees Tunnel transfer system distributes Kielder Reservoir releases to River Derwent, River Wear and River Tees. The large surplus in this WRZ means that there is no requirement to plan a new water resource scheme to supply new development.

The WRMP shows that climate change will have little impact on the deployable output for the Kielder WRZ due to the Kielder Reservoir Tyne-Tees transfer and will continue to have a significant surplus of resources throughout the planning period. The lack of deficit means that there is no requirement to plan a new water resource scheme in the WRZ.

Berwick and Fowberry WRZ

The Berwick and Fowberry WRZ covers a small area to the Northeast of Northumberland and supplies water to approximately 1% of NW customers. In this WRZ, non-household demand is approximately double the domestic demand, the majority of which is associated with the tourist industry. Since the mid-1990s, there has been a change towards all year round tourism, rather than just in the summer months. This has been observed in NW's water demand data, which shows a fairly constant demand all year round, rather than an excessive peak demand in the summer. Therefore, the Berwick and Fowberry WRZ now uses a Dry Year Annual Average planning scenario rather than an Average Day Peak Week scenario to reflect this change.

An option was identified in the feasibility study (that was underway during the Outline WCS) to strengthen the supply link between the two areas by building new pipe infrastructure. The plan was to implement this option during AMP5 (2010 – 2015), however the Environment Agency has since identified uncertainty in the sustainability of the Berwick licences. Therefore the option has been put on hold and an NEP investigation has been planned for completion in AMP6 to assess the yield of the boreholes.

In 2013, NW began a programme of work to refurbish and better maintain each borehole in the Berwick and Fowberry WRZ, with the aim of completion in AMP6. This will improve the output of each source and improve resilience to the WRZ.

The WRMP states that at present, the Berwick and Fowberry WRZ has significant licensed surplus supply, however there is uncertainty in the sustainable volume of water available from the groundwater sources. The Environment Agency Review of Consents may lead to a reduction in abstraction license in the Berwick and Fowberry WRZ, causing a significant reduction in deployable output for this WRZ after 2020. An NEP investigation, consisting of comprehensive monitoring and modelling studies of groundwater sources, is to be carried out by NW and the Environment Agency during the AMP6 period (2015–2020), to decide whether or not permanent changes to licenses may be needed post 2020. In the meantime, in order to increase the resilience of the Fowberry area, the Environment Agency has agreed to the Fowberry abstraction licence variation, which allows greater abstraction from the boreholes in that area. This licence variation began in 2008 and is due to expire in 2018, after which NW will apply to renew this agreement.

Population

The WRMP was developed using a lower base year population and a lower population growth rate than that adopted for WRMP 2009. Therefore the population increases from a current 2.514m to 2.691m in 2035, compared to a 2035 projection of 2.747m using the WRMP 2009 method. The property numbers used in the WRMP 2014 were also reduced compared to the previous plan, based on the housing market during the current AMP period and the previous forecast. The WRMP 2014 was developed before NCC had completed their Local Plan, therefore NW were not able to incorporate the exact core strategy housing development numbers into the WRMP.

Water Efficiency

NW forecasts a decline in household per capita consumption (pcc) through to 2040 as a result of NW's metering strategy and promotion of water efficiency. Over the next 10 years, NW's metering strategy requires all new housing developments to be fitted with a water meter, however meters are optional for existing households. NW's water efficiency activity aims to reduce pcc by 0.28 litres/head/day annually over 25 years.

4.5 Flood risk

4.5.1 *Outcomes of the Outline WCS*

The following key flood risk issues were identified across Northumberland in the Outline WCS (May 2012):

TABLE 4-8: OUTLINE WCS FLOOD RISK SUMMARY

Flooding Type	Areas in Northumberland affected by the flooding
Fluvial Flooding	Some areas across the County have been historically affected by a long history of flooding, including Belford, Hexham, Morpeth, Ponteland, Rothbury and Wooler. There are also some smaller settlements which are susceptible to flash flooding, such as Bellingham, Buttery Haugh and Rothbury.
Tidal Flooding	A number of areas suffer historically from tidal flooding, including Amble, Alnmouth, Warkworth, Seahouses, Berwick, Blyth and Bamburgh.
Surface Water Flooding	Surface water flooding is most serious in the urban areas of Northumberland including Cramlington, Hexham, Morpeth and Ponteland
Sewer Flooding	Historical sewer flooding records provided by NW show that there have been reports of isolated sewer flooding incidents across Northumberland
Groundwater Flooding	Groundwater flooding is considered to be low across Northumberland except in Berwick.

4.5.2 ***Updates to the Baseline Flood Risk assessment data and guidance***

Since the Outline WCS was produced, the following flood risk management guidance and maps have been updated:

- In March 2012, the National Planning Policy Framework[33] (NPPF) and accompanying Planning Practice Guidance for Flood Risk and Coastal Change[34] (PPG) were published, which replaced the Planning Policy Statement 25 (PPS25) Development and Flood Risk[35]. The accompanying NPPF Technical Guidance[36] was also published in March 2012 and has now been superseded by the revised NPPF PPG published as an on-line resource in 2014.
- In December 2013, the Environment Agency produced the updated Flood Map for Surface Water (uFMfSW).
- Following a consultation by Defra on the delivery of SuDS[37] in 2014 the Department for Communities and Local Government (DCLG) issued a Written Ministerial Statement[38] outlining the Government's response regarding the future of SuDS. This has since been adopted as a Sustainable Drainage Systems policy sitting alongside the NPPF and makes Lead Local Flood Authorities (LLFAs) statutory consultees for planning applications with regards to surface water management.The PPG has also been amended to reflect the new approach to implementation of SuDS in development. Therefore, from 6 April 2015, NCC (as the LLFA) is the statutory consultee for planning applications for major developments that have a drainage implication.
- The NCC Level 2 Strategic Flood Risk Assessment[39] (SFRA) was produced in October 2015, and has been prepared in accordance with the principles set out in the NPPF and latest supporting PPG.

Updated Flood Map for Surface Water (uFMfSW)

The Environment Agency undertook further modelling of surface water flood risk at a national scale and produced the uFMfSW in December 2013. The uFMfSW identifies areas at risk of surface water flooding during three annual exceedance probability (AEP) events:

- 1 in 30 year (>=3.33% AEP) – High Risk,
- 1 in 100 year (>=1% AEP) – Medium Risk, and
- 1 in 1000 year (>=0.1% AEP) – Low Risk.

The uFMfSW maps are not suitable for identifying whether an individual property will flood, neither are they intended to be definitive. Rather the uFMfSW provides information to support local flood risk management and can be used to assess strategic development sites.

[33] Department for Communities and Local Government. 2012. *National Planning Policy Framework*. Available at:http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950.
[34] Department for Communities and Local Government. 2014. Planning Practice Guidance for Flood Risk and Coastal Change. Available at http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/
[35] Department for Communities and Local Government. 2010. *'Planning Policy Statement 25: Development and Flood Risk,* TSO: London.
[36] Department for Communities and Local Government. 2012. '*Technical Guidance to the National Planning Policy Framework*'. TSO: London. Available at: http://www.communities.gov.uk/publications/planningandbuilding/nppftechnicalguidance
[37] Defra / DCLG (September 2014) Delivering Sustainable Drainage Systems: Consultation
[38] Department for Communities and Local Government (Dec 2014) House of Commons Written Statement (HCWS161) Sustainable Drainage Systems.
[39] URS, Draft NCC Level 2 SFRA (2014), Northumberland County Council

Northumberland Level 2 SFRA

The NPPF and supporting guidance require Local Planning Authorities (LPAs) to undertake SFRAs and to use their findings, and those of other studies, to inform strategic land use planning including the application of the Sequential Test which seeks to steer development towards areas of lowest flood risk prior to consideration of areas of greater risk.

The Northumberland Level 2 SFRA assesses the strategic development sites that are primarily susceptible to fluvial or tidal flood risk, however flooding from the following sources are also considered:

- Surface water runoff from land (using the uFMfSW);
- Groundwater (EA Groundwater Vulnerability Maps);
- Sewers (NW provided updated DG5 data based on 100 square meter grids); and
- Other Artificial Sources, e.g. reservoirs.

The assessments in Section 4 of the Northumberland Level 2 SFRA determine the flood risk issues with regards to the vulnerability classification of the proposed land uses at the sites. In addition to the strategic development sites, SHLAA sites have been assessed for Fluvial/Tidal flood risk which have been used in this detailed WCS.

4.5.3 *Updated Flood Risk Summary*

The detailed fluvial, tidal and surface water flood risk assessments for each potential development area option are included in the site specific assessments in Section 5. Further detailed risk assessment for all sources of flooding, as well as policy and guidance recommendations for potential development area options are included within Section 4 of the Northumberland Level 2 SFRA.

4.6 Surface Water Management and Sustainable Drainage

4.6.1 *Outcomes of the Outline WCS*

The Outline WCS (May 2012) used data from the Level 1 SFRA and sewer flooding data from 2011 to determine the general level of flood risk associated with the previously proposed development areas. The study concluded that development in South East Northumberland could be constrained due to the discharge of surface water to tidal reaches potentially being impacted during 'tide locked' conditions. Therefore, new development must consider the impact of further urbanisation on the existing pumped system, and discharge of surface water must be mitigated within the pumped limitations of the drained system. The incorporation of SuDS into development footprints at an early stage is therefore essential to meeting the aspiration of sustainable water management in the study area.

The Outline WCS assessment of the likely capacity for infiltration type SuDS showed that the majority of the study area is not suitable for infiltration (with the exception of small isolated areas in Prudhoe) and will therefore be reliant on surface attenuation and runoff restriction, which will require sites to make land provision for this mitigation. However, all site specific flood risks assessments (FRAs) would still need to consider the suitability of infiltration SuDS at the local scale.

4.6.2 *Updates to the Baseline Surface Water Management and SuDS assessment data*

SuDS are an approach to managing rainwater and surface water that replicates natural drainage, the key objectives being to manage flow rate and volume of runoff to reduce risk of flooding and water pollution.

From 6 April 2015, LPAs need to ensure that local planning policies and decisions on planning applications relating to major development[40] include SuDS for the management of run-off, unless demonstrated to be inappropriate. Minor developments with drainage implications continue to be subject to existing planning policy (Section 103 of the NPPF) but smaller developments in flood risk areas should still give priority to the use of SuDS.

The PPG has been amended to state:

"Sustainable drainage systems may not be practicable for some forms of development (for example, mineral extraction). New development should only be considered appropriate in areas at risk of flooding if priority has been given to the use of sustainable drainage systems. Additionally, and more widely, when considering major development, sustainable drainage systems should be provided unless demonstrated to be inappropriate."

NCC, as the Lead Local Flood Authority (LLFA), are a statutory consultee for planning applications for major developments that have a drainage implication. As a statutory consultee, the LLFA has a duty to respond to the LPA and report on their performance on providing a substantive response within deadlines set out in legislation.

Further information on the requirements for developers in Northumberland will be available through the NCC website, when available. NCC is looking to develop a Local SuDS Guidance document outlining the requirements for SuDS within Northumberland. This will supplement the National Non-Statutory Technical Standards[41] (NS) which must be accorded with for all development.

Updated Surface Water Management and SuDS Summary

The detailed surface water flood risk and SuDS constraints assessments for each potential development area option are included in the site specific assessments in Section 5.

The Level 2 SFRA recommends that a Surface Water Management Plan (SWMP) should be undertaken by NCC for the primary urban areas of Morpeth, Berwick, Belford, Ponteland, Hexham, Haltwhistle, Cramlington, Amble and Blyth as identified through the Level 1 SFRA. The SWMPs will be developed subject to further assessment of local information to determine if they are required.

It should be noted that the limitations and constraints on the suitability or location of infiltration SuDS will be specific to each site, and for the purposes of the detailed WCS, a higher-level assessment has been undertaken that identifies the potential key constraints for potential development areas. Developers are required to consult NCC as LLFA for SuDS applications.

4.6.3 *Green Infrastructure*

The natural environment, protected sites, landscape and green spaces, biodiversity and heritage of Northumberland combine to deliver the County's Green Infrastructure[42] (GI) resource. This resource (which occurs at all scales from the urban centre to the rural countryside) comprises some of the most important assets within the County, defining the area and giving it a sense of place.

[40] The definition for Major and Minor developments are set out in the Town and Country Planning Order 2010
[41] DEFRA (2015) Non-statutory technical standards for sustainable drainage systems https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
[42] Northumberland Green Infrastructure Strategy: http://www.northumberland.gov.uk/default.aspx?page=3458

The Northumberland GI Strategy was produced in October 2011. The vision of the Strategy 'reflects the need to develop a network of multi-functional man made, natural and semi-natural assets, which together provide a quality and beneficial environment, supporting both people and wildlife'. In summary the Strategy hopes to identify environmentally sensitive areas and provide a long term strategy for enhancing their ecosystems and recreational and cultural significance.

Future development in Northumberland should take into account the recommendations, vision and aims of GI Strategy, and these should be integrated with the WCS where possible. For example there is likely to be an opportunity to protect/enhance Green Infrastructure with the delivery of flood risk management measures. The following principles should be considered for new developments to enhance/protect GI in the future:

- All new development and redevelopment schemes should make a significant contribution to the County's GI network and should fully integrate into the surrounding landscape whilst providing links to existing communities and contributing to predicted climate change;
- Development and regeneration proposals should provide high quality open green space that promotes social cohesion and make a positive contribution to the quality of life for local people while generating a net gain in the County's Biodiversity Action Plan (BAP) targets;
- Proposals should be designed to ensure that development is of high quality, contributes to combating predicted climate change and environmental sustainability, in order to support the economic, social and environmental aspirations for Northumberland;
- Use should be made of planning conditions and planning obligations to secure the necessary and appropriate funds for the provision of high quality management and maintenance of green infrastructure;
- Protect and seek to improve the function and integrity of natural systems (soils, bio and geo diversity and hydrology).

4.7 Climate Change

4.7.1 *Background*

The North East Climate Change Adaptation Study[43] considered climate change for ten sites in the North East of England, four of which were within Northumberland. The study found the following key projected findings to Northumberland's climate and change in sea level in the period of up to 2050:

- Annual rainfall reductions throughout the region by up to 10%;
- Increased seasonality of rainfall with increases of up to around 21% in winter and reductions of up to around 37% in summer;
- Variability in extreme rainfall events, but increase of up to around 20% will be felt in some areas;
- Average seasonal temperatures to increase, with a region-wide annual average daily temperature change of just under 2°C;
- Extreme hot temperatures will increase by around 3°C;
- Heatwaves are likely to increase in frequency of occurrence;

[43] Sustaine, Royal Haskoning & UKCIP (2008) http://www.climatenortheast.com/contentControl/documentControl/Climate%20Change%20Adaptation%20Study.pdf

- A reduction in the number of frost days;
- A major reduction in winter snowfall, of around 45 per cent to 83 per cent across the region;
- There is variability in the projected winter wind climate, but small increases will be felt in some areas;
- An increase in mean sea levels of around 0.3m; and
- An increase in sea surge levels of around 0.30m to 0.35m.

It is therefore essential that any development within the NCC area considers; the effects climate change may have on the new development and the effects the new development may have on exacerbating/ alleviating climate change impacts. In regards to Northumberland's WCS the effects of climate change on water resources and the water environment is likely to be the most pertinent consideration. It is essential that a comprehensive and holistic approach is taken when considering the impacts of climate change and new developments, for instance the implementation of SuDS will be integral to proactive water management for both now and in the future when such drainage systems may be dealing with greater influxes of water as a result of increasing frequency and magnitude of extreme weather events.

4.7.2 *Potential climate change adaptation and mitigation*

Table 4-9 provides a summary of the potential climate change adaptation and mitigation measures that could be considered in Northumberland County Council with regards to water quality and wastewater services infrastructure, and water resources and water supply infrastructure. The organisations likely to be responsible for leading these measures have been identified alongside the suggested timescale for these actions to start being taken forward (Immediate, Medium (1 - 10 years) and Long (10+ years)).

TABLE 4-9: POTENTIAL CLIMATE CHANGE ADAPTION AND MITIGATION

Potential Climate Change		Potential Impact	Adaption and Mitigation Measures	Lead Organisation (s)				Timescale for Action
				NCC	EA	NW	NE	
Temperature Rise	Water Quality and Wastewater	• Decrease in Dissolved Oxygen in rivers – impact on river ecology and wildlife • Faster wastewater asset deterioration • Changes in wastewater process efficiency	Ensure climate change mitigation strategies are in place for species and habitats at risk, e.g. BAPS		✓		✓	Medium
			Monitor long-term Dissolved Oxygen levels in rivers and impacts		✓			Medium
			Improve resilience of wastewater assets to temperature rise, where new assets are required or upgraded			✓		Medium
	Water Resources	• Increase in demand for water in summer • Increased evapotranspiration • Increased peak demand • Faster water supply asset deterioration • Changes in process efficiency	Ensure regional drought plans take into account the impacts of climate change		✓	✓		Medium
			Manage seasonal changes in climate by reducing summer peaks in demand for water	✓		✓		Medium
			Contribute to managing water demand through increased water efficiency in homes, businesses, industry and agriculture and promotion of water efficiency measures	✓	✓	✓		Immediate
Winter rainfall increase	Water Quality and Wastewater	• Increased diffuse pollution • Insufficient infrastructure capacity – storm tanks, CSOs etc. • Increased risk to rivers from combined sewer outflows	Where possible, control diffuse pollution runoff through SuDS	✓	✓	✓	✓	Immediate
			Promoting the creation and preservation of space (e.g. verges, agricultural land, and green urban areas, including roofs) in support of water quality, biodiversity and flood risk goals	✓	✓		✓	Immediate
	Water Resources	• Opportunity for more water storage • Inadequate pump capacity for raw water • Increased diffuse pollution	Manage seasonal changes in climate by increasing winter storage			✓		Medium
			Endure adequate pump capacity for increased winter storage requirements			✓		Medium
			Where possible, control diffuse pollution runoff through SuDS, particularly for new / redevelopment close to river and water bodies	✓	✓	✓	✓	Immediate
Summer rainfall decrease	Water Quality and Wastewater	• Degraded wetlands • More frequent low river flows • Less dilution in rivers for wastewater discharge • Reduced risk to rivers from combined sewer outflows • Tightening of discharge permit • Reduced flexibility – effluent required to maintain river flows	Ensure climate change mitigation strategies are in place for species and habitats at risk, e.g. Biodiversity Action plans		✓		✓	Medium
			Consideration of future climate change impacts on wastewater discharges when renewing permits		✓	✓		Medium
	Water Resources	• More frequent low river flows • Increased competition for water • Increased peak demand • Changing customer expectations	Manage seasonal changes in climate by reducing summer peaks in demand for water	✓		✓		Medium
			Contribute to managing water demand through increased water efficiency in homes, businesses, industry and agriculture and promotion of water efficiency measures	✓	✓	✓		Immediate
			Ensure that water abstraction is sustainable through monitoring		✓	✓		Medium
Increase in weather extremes (heatwaves, intense rainfall, storms)	Water Quality and Wastewater	• Increased flooding and risk of service loss • Increased clean-up costs • Inability of infrastructure to cope • Increased subsidence – pipe failure	Promoting the creation and preservation of space (e.g. verges, agricultural land, and green urban areas, including roofs) in support of water quality, biodiversity and flood risk goals	✓	✓		✓	Immediate
			Improve resilience of key wastewater assets such as CSOs, WwTW and outfalls, including new industry design standards for wastewater assets			✓		Medium
	Water Resources	• Increased run-off reduces recharge of aquifers • Decrease in raw water quality – increased treatment cost • Increased flooding and risk of service loss • Increased flooding and risk of service loss • Increased subsidence – pipe failure • Increased contamination / Peak demand delivery during heat waves	Improve resilience of key water supply assets such as pumps, including new industry design standards for water assets			✓		Medium
			Where possible, control diffuse pollution runoff through SuDS, particularly for new / redevelopment close to river and water bodies	✓	✓	✓	✓	Immediate
			Improve RBMP Programme of Measures to ensure WFD objectives are met and include climate change allowance		✓			Medium

5 POTENTIAL DEVELOPMENT AREA OPTIONS ASSESSMENTS

5.1 Introduction

Following the WCS assessment at the County level, this chapter addresses infrastructure capacity, flood risk and SuDS constraint issues related to potential development areas. A detailed assessment has been carried out for each potential development area option within a settlement area. The maps contained in Section 5 are for illustrative purposes only and identify potential development areas and the SHLAA sites which make up these potential development areas. Not all SHLAA sites have been identified.

The following settlement areas have been assessed for development:

TABLE 5-1: SETTLEMENT AREAS

Settlement Area	Delivery Area	Settlement Area	Delivery Area
Alnwick	North	Whalton	Central
Berwick upon Tweed	North	Stannington Station	Central
Belford and Seahouses	North	Tranwell Woods	Central
Rothbury	North	Longhorsley	Central
Wooler	North	Amble	South East
Norham	North	Ashington	South East
Cornhill on Tweed	North	Bedlington	South East
Scremerston	North	Blyth	South East
Whittingham	North	Cramlington	South East
Glanton	North	Guildpost, Stakeford and Choppington	South East
Hexham	Central	Newbiggin-by-the-Sea	South East
Morpeth	Central	Seaton Valley	South East
Prudhoe	Central	Lynemouth	South East
Corbridge	Central	Ellington	South East
Ponteland	Central	Widdrington Station / Stobswood	South East
Stocksfield	Central	Hadston	South East
Wylam	Central	Haltwhistle	West
Ovingham	Central	Haydon Bridge	West
Horsley	Central	Bellingham	West
Newcastle Airport Expansion	Central	Allendale	West
Hedley on the Hill	Central	Fourstones / Newbrough	West
Heddon on the Wall	Central	Humshaugh	West
Marley Tiles Site	Central	Barrasford	West
Stannington Hospital Site	Central	Gunnerton	West
Stannington	Central	Great Whittington	West
Longhirst	Central	Bardon Mill / Redburn / Henshaw	West

5.2 Potential Development Area Assessment Tables

Table 5-2 provides an overview of the Red/Amber/Green (RAG) matrix used to assess the different aspects of the water cycle in relation to the potential development area. Green indicates there is no constraint for the potential development area, Amber indicates a possible constraint for the potential development area, and Red indicates that there is an immediate constraint for the potential development area.

TABLE 5-2: KEY TO THE RAG ASSESSMENT

WCS component	No constraint	Possible constraint	Immediate constraint
Water Resources	Surplus water supply from Kielder WRZ	Possible constraints to water supply from Berwick and Fowberry WRZ	-
Overall WwTW Assessment	Capacity available and no WQ consent issues	Capacity constraints but no WQ consent issues	Capacity constraints and likely WQ constraints
Receiving Watercourse	Name of the watercourse (and WFD ID) that the WwTW discharges into		
Sewer Type	Description of sewer type, diameter of pipe and route to the WwTW		
Sewer Flooding	No sewer flooding records	Sewer flooding has been reported – identifying which SHLAA site(s) is affected	-
Sewer Capacity Factor (2020)	1, 2, 3	4 – identify which SHLAA site(s) is affected	**5** – identify which SHLAA site is affected
SW Capacity Factor (2020)	1, 2, 3	4 – identify which SHLAA site(s) is affected	**5** – identify which SHLAA site is affected
Diversion/ Easement	Either no conflicts or some diversion/easement may be required	NWM would object to the development due to asset location	-
Fluvial/Tidal Flood Risk	All the SHLAA development sites are within Flood Zone 1	FZ 2, 3a, 3b – identify which SHLAA site(s) is affected	-
SW Flood Risk	All the SHLAA development sites have a very low risk of SW flooding	At least one of the SHLAA development site for this potential development area option is within an area at risk of surface water flooding	-
Bedrock Permeability	Very High, High, Moderate, Low or Very Low		
Superficial Permeability	Very High, High, Moderate, Low or Very Low		
SPZ	SPZ 2, 3	SPZ 1	-
SuDS Constraints	No constraints	SPZ 1 or Low superficial permeability	-

Assumptions:

- For potential development area options that only partly fall within a higher constraint category (amber or red), the individual SHLAA site affected by that constraint has been identified.

- From the NW diversion/easement assessment, sites that NW would object to because they are in close proximity to the WwTW have been classified as amber. Other sites where there are no conflicts or that may require some diversion or easement, but they are not unacceptable to NW, are classified as green. These boxes have been left empty for each potential development area option unless they are amber or they are in close proximity to a SPS, in order to make the assessment summary table clear. For all sites it is vital that developers consult NW at the pre-development enquiry stage to agree details before designing their site layout to enable NW to agree the necessary level of asset protection.

The potential development option information for Rest of North Delivery Area Scenario 2 was not available for assessment at the time of publication of the Final Report. Once available, this information will be assessed separately and included as an addendum to the Final Report.

5.3 North Northumberland Delivery Area

5.3.1 *Alnwick*

Overview of proposed development

Alnwick is a historic market town and has a development scenario of 1000 dwellings. The preferred potential development area option is to the South of the settlement area, which can supply 270 housing units, therefore the rest of the scenario will need to be made up using one additional/alternative potential development area options (Table 5-3).

Alnwick has the potential to develop 19.566 ha of employment land.

Foul flows from development within Alnwick will drain to Alnwick WwTW which is situated to the east of Alnwick, immediately west of the A1 and discharges treated effluent into the River Aln.

TABLE 5-3: POTENTIAL DEVELOPMENT AREA OPTIONS IN ALNWICK

Settlement Area	Dwellings Target	Potential development area options	Option Type	Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Alnwick	1000	South	Preferred	270	67	67	68	68	19.566
		North East	Additional/ Alternative	300	75	75	75	75	
		East of Swansfield Park	Additional/ Alternative	250	62	62	63	63	
		North West (Redevelopment of school)	Additional/ Alternative	130	32	32	33	33	

WCS Assessment Summary

Table 5-4 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-1 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Alnwick WwTW currently has 800 units foul headroom available, therefore the works may require an upgrade to accommodate the new development. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- The sewer network near the East of Swansfield Park potential development area option has a historic record of sewer flooding and a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required before development can commence in this area.
- A Public Sewer crosses the North East potential development area option and NW would require it to be diverted or placed within a suitable easement. The north east part of the site is near to Alnwick WwTW and NW would object to the development of the site. Therefore development should be steered to the south of the potential development area option or alternative potential development area options progressed for this settlement.

- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-4: ALNWICK SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
South	Kielder WRZ	Alnwick WwTW	River Aln GB103022076350	· **Foul sewer** (150mm) connects to a combined sewer system to the east of the Willowburn Trading Estate (300mm diameter), which drains northeast to Alnwick WwTW. · **SW sewer** (225mm) discharges into Willow Burn.		-	-		FZ1	Y	Very High	High		
North East				· **Combined sewer** (900mm diameter to the north, 300mm diameter to the south)		3	-	A Public Sewer crosses the site and NW would require it to be diverted or placed within a suitable easement. Part of the site is also near to a WwTW and NW would object to the development of the site.	FZ1	Y	Very High	Very High		
East of Swansfield Park				· **Combined sewer** (225mm) drains north-eastwards to Alnwick WwTW.	SHLAA 282 - Sewer flooding has been reported to the east of the site.	SHLAA 282 - 5	-		FZ1	Y	Very High	Very High		
North West (School)				· **Combined sewer** (225mm) drains north-eastwards to Alnwick WwTW.		-	-	-	FZ 1	Y	Very High	Very High		
Employment Area A03				· **Combined sewer** (300mm) drains north-eastwards to Alnwick WwTW.		-	-	-	FZ 1	Y	Very High	Very High		
Employment Areas A06 and A13				· **Foul sewer** (255mm) connects to a combined sewer system to the east of the Willowburn Trading Estate (300mm diameter), which drains northeast to Alnwick WwTW. · **SW sewer** (225mm) discharges into Willow Burn.		-	-	-	FZ 1	Y	Very High	High		
Employment Areas A15, A17, A18 and A19 (5ha)				· **Foul sewer** (150- 300mm) connects to a combined sewer system to the east of the Willowburn Trading Estate (300mm diameter), which drains northeast to Alnwick WwTW. · **SW sewer** (300-750mm) discharges into Willow Burn.		-	-	-	FZ 1	Y	Very High	Very High		
Mixed use location alternative				· **Foul sewer** (150mm) connects to a combined sewer system to the east of the Willowburn Trading Estate (300mm diameter), which drains northeast to Alnwick WwTW. · **SW sewer** (225mm) discharges into Willow Burn.		-	-	-	FZ 1	Y	Very High	High		

5.3.2 *Berwick upon Tweed*

Overview of proposed development

There are two scenarios for development in Berwick upon Tweed; Scenario 1 has a dwellings target of 900 houses and Scenario 2 has a target of 840 houses.

The preferred potential development area options are to the North West of the settlement area, which can supply 300 housing units, and to the South of East Ord, which can supply 650 housing units (Table 5-5).

Berwick upon Tweed has the potential to develop 8.811 ha of employment land.

Foul flows from development within Berwick will drain to Berwick WwTW which discharges treated effluent into the tidal River Tweed.

TABLE 5-5: POTENTIAL DEVELOPMENT AREA OPTIONS IN BERWICK UPON TWEED

Settlement Area	Dwellings Target	Potential development area options	Option Type	Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Berwick upon Tweed	Scenario 1 900 Scenario 2 840	North West	Preferred	300	75	75	75	75	8.811
		South of East Ord	Preferred	650	162	162	163	163	
		Tweedmouth Grove	Additional/ Alternative	450	112	112	113	113	
		South of River Tweed	Additional/ Alternative	270	67	67	68	68	
		South East of Tweedmouth	Other Key Sites	150	37	37	38	38	

WCS Assessment Summary

Table 5-6 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-2 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Berwick upon Tweed's water resource is supplied by the Berwick and Fowberry WRZ, which is abstracted from groundwater sources. NW's WRMP states that at present, the Berwick and Fowberry WRZ has significant licensed surplus supply, however there is uncertainty in the sustainable volume of water available from the groundwater sources. The Environment Agency Review of Consents may lead to a reduction in abstraction license in the Berwick and Fowberry WRZ, causing a significant reduction in deployable output for this WRZ after 2020 (see Section 4.4.2). Careful consideration should be given to the siting of some types of development in this area to ensure the adequate protection of existing abstraction sources. NW must be consulted on the water supply for all proposed development in Berwick upon Tweed and water efficiency options are considered.
- The North West, South of East Ord, Tweedmouth Grove and South of River Tweed potential development area options have a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge

surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.

- Further investigation and possible infrastructure upgrades may be required before development can commence.

- The North West, Tweedmouth Grove and South of River Tweed potential development area options have a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required.
- The South of River Tweed potential development area option is located within Flood Zone 2 and 3b. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- Employment area B04 is located within SPZ 1, and therefore infiltration SuDS are unlikely to be suitable in this location except for clean roof runoff. Local site investigations would be required to assess SuDS options prior to development.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-6: BERWICK UPON TWEED SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul `Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
North West	Berwick and Fowberry WRZ	Berwick upon Tweed WwTW	River Tweed GB650301440000	· **Foul sewer** (150mm) This location is to the north of the River Tweed, therefore it will require the use of the crossing at Royal Tweed Bridge, which may limit capacity · **SW sewer** (375mm) discharges into the River Tweed.		5	SHLAA 1278 - 5		FZ 1	Y	Moderate	High		
South of East Ord				· **Foul sewer** (150-225mm) Drains northwards to a combined (300mm diameter) sewer system along the A698 Ord Drive, which connects to Berwick upon Tweed WwTW. · **SW sewer** (225mm) discharges into the River Tweed.		3, 4, 5	3, 4		FZ 1	Y	High	High	SHLAA 1067 and 1008 – SPZ 3	
Tweedmouth Grove				· **Foul sewer** (150-300mm) Drains northward, where the foul sewer connects to a combined (300mm diameter) sewer system along the A698 Ord Drive, which connects to Berwick upon Tweed WwTW. · **SW sewer** (975mm) discharges into the River Tweed.		5	SHLAA 1187 - 5		FZ 1	Y	High	High	SHLAA 1187, 1055, 1115 – SPZ 3	
South of River Tweed				· **Combined sewer** (300mm) · **SW sewer** (600mm) discharges into the River Tweed.		5	5		SHLAA 1411 and 1414 – FZ 2, 3b	Y	High	Very High	SHLAA 1116 and 1167 – SPZ 3	
South East of Tweedmouth (150)				· **Combined sewer** (300mm) The combined sewers drain northwards, then eastwards through Spittal Hall, then north to the Berwick upon Tweed WwTW.		-	-	-	FZ 1	Y	High	High		
Employment Area B12				· **Foul sewer** (150mm) This location is to the north of the River Tweed, therefore it will require the use of the crossing at Royal Tweed Bridge, which may limit capacity. · **SW sewer** (255mm) discharges into the River Tweed.		-	-	-	FZ 1	Y	Very High	High		
Employment Area B04				· **Combined sewer** (300mm) · **Foul sewer** (375mm) This site is very close to the WwTW.		-	-	-	FZ 1	Y	High	High	SPZ 1, 3	Infiltration to ground may be restricted for some development
Employment Area B03				· **Combined sewer** (225mm)		-	-	-	FZ 1	Y	High	High	SPZ 3	

5.3.3 *Belford and Seahouses*

Overview of proposed development

There are two scenarios for development in Belford and Seahouses;

Scenario 1: 200 houses in Belford and 300 houses in Seahouses

Scenario 2: 230 houses in Belford and 230 houses in Seahouses

The preferred potential development area options are to the South West of Belford and the North West of Seahouses. Alternative / additional potential development area options are located to the South East of Seahouses and South of North Sunderland. Other key sites are located in Beadnell, Bamburgh and Lucker (Table 5-7).

Belford has the potential to develop 0.776 ha of employment land and Seahouses has the potential to develop 0.834 ha of employment land.

Foul flows from development within Belford will drain to Belford WwTW, which discharges treated effluent into Belford Burn. Foul flows from development within Seahouses will drain to Seahouses WwTW, which discharges treated effluent into the North Sea.

TABLE 5-7: POTENTIAL DEVELOPMENT AREA OPTIONS IN BELFORD AND SEAHOUSES

Settlement Area	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Belford	Scenario 1 200 Scenario 2 230	South West Belford	Preferred	300	75	75	75	75	0.776
Seahouses	Scenario 1 300 Scenario 2 230	North West Seahouses	Preferred	200	50	50	50	50	0.834
		South East Seahouses	Additional/ Alternative	100	25	25	25	25	
		South of North Sunderland	Additional/ Alternative	100	25	25	25	25	
		Breadnell / Bamburgh / Lucker	Other Key Sites	-	-	-	-	-	

WCS Assessment Summary

Table 5-8 provides a summary of the WCS site assessment for each of the potential development area options. Figures 5-3 and 5-4 show the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Through consultation, the Environment Agency has raised awareness of eutrophication issues at Budle Bay, which may impact on potential development options in Belford.

Infrastructure Recommendations

- Foul flows from all planned development in Belford can be accommodated by Belford WwTW as the scheme is complete.
- There is currently no headroom available at Seahouses WwTW. NW investigations are to be planned to assess the reasons for no headroom. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment, however, this is likely to be achievable within current best technology.

- The sewer network in Beadnell has a historic record of sewer flooding, as well as a 2020 sewer capacity factor of 5 and a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. The South of North Sunderland potential development area option and SHLAA site 1059 in the Southwest Belford potential development area option have a 2020 sewer capacity factor of 5.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
  - Further investigation and possible infrastructure upgrades may be required before development can commence.
- The Belford Employment Area B01 and South East Seahouses potential development area options are located within Flood Zone 2 and North East Seahouses is located in Flood Zone 2 and 3. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All development sites, except Beadnell, are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-8: BELFORD AND SEAHOUSES SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Southwest Belford	Kielder WRZ	Belford WwTW	Belford Burn GB103022076460	· **Foul sewer** (225mm) The foul sewer connects to a combined sewer, which drains to Belford WwTW · **SW sewer** (450mm) discharges to the Belford Burn.		SHLAA 1059 - 5	-		FZ 1	Y	High	High		
Belford Employment Area B01				· **Foul sewer** (160mm) connects to Belford WwTW · **SW sewer** (600mm) discharges to the Newlands Burn.		-	-		FZ 2	Y	High	High		
North West Seahouses		Seahouses WwTW	North Sea	· **Combined sewer** (150 mm) combined sewer drains south-eastwards to Seahouses WwTW.		3	-		FZ 2 & 3	Y	High	High		
South East Seahouses				· **Combined sewer** (150 - 315mm)		3	3		FZ 2	Y	Very High	High		
South of North Sunderland				· **Combined sewer** (225mm) drains south-eastwards to Seahouses WwTW. · **SW sewer** (450mm) discharges to the Annstead Burn.		4, 5	3		FZ 1	SHLAA 1179 - Y	High	High		
Beadnell				· **Combined sewer** (160mm) Beadnell is located to the south of Seahouses, is connected to Seahouses WwTW	Sewer flooding has been reported in Beadnell, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	5	5		FZ 1		High	High		
Bamburgh				· **Combined sewer** (160mm) Bamburgh is located to the north of Seahouses, is connected to Seahouses WwTW		-	-		FZ 1	Y	Very High	High		
Seahouses Employment Area B05				· **Combined sewer** (150mm)		-	-		FZ 1	Y	Very High	High		
Lucker		**No public sewerage system or NW owned treatment facility.**			**N/A**	**N/A**	**N/A**	**N/A**	FZ 1	Y	High	High		

5.3.4 *Rothbury*

There are two scenarios for development in Rothbury; Scenario 1 has a dwellings target of 380 houses and Scenario 2 has a target of 200 houses.

The preferred potential development area options are in the North East of the settlement area, which can supply housing 100 units, and in the South East of the settlement area, which can supply 110 housing units (Table 5-9).

There are no planned employment opportunities in this settlement area.

Foul flows from development within Rothbury will drain to Rothbury WwTW which is situated to the south east of Rothbury, between the River Coquet and Mill Lane. Rothbury WwTW discharges treated effluent into the River Coquet.

TABLE 5-9: POTENTIAL DEVELOPMENT AREA OPTIONS IN ROTHBURY

Settlement Area	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Rothbury	Scenario 1 380 Scenario 2 200	North East	Preferred	100	25	25	25	25	N/A
		South East	Preferred	110	28	28	27	28	

WCS Assessment Summary

Table 5-10 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-5 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

The Environment Agency has advised that due to the public water supply intake at Warkworth, a cumulative pollutant loadings assessment is required within the River Coquet to assess the impact of potential development on the river quality.

Infrastructure Recommendations

- Rothbury WwTW currently has headroom for foul flows from 55 new homes after which it would not accept additional flows until works had been upgraded. NW plan to investigate the requirement for an upgrade in AMP 6 (2015-20). If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- The North East potential development area option has a 2020 sewer capacity factor of 4, which suggests that the development could create a hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required before development can commence.
- The South East potential development area option has a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required.

TABLE 5-10: ROTHBURY SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
North East	Kielder WRZ	Rothbury Ww TW	River Coquet GB103022076692	· **Combined sewer** (450mm) · **Foul sewer** (150mm) This site is north of the River Coquet and will therefore need to utilise the combined sewer which crosses the river which may limit capacity. · **SW sewer** (225mm) discharges to the River Coquet.		SHLAA 6828 - 4	-		FZ 1		High	Very High		
South East				· **Foul sewer** (150mm) connects to a 150mm diameter combined sewer, which drains a caravan park before connecting to Rothbury Ww TW. · **SW sewer** (150mm) discharges to the River Coquet.		2	5		FZ 1		High	Low		

5.3.5 *Wooler*

Overview of proposed development

There are two scenarios for development in Wooler; Scenario 1 has a dwellings target of 380 houses and Scenario 2 has a target of 280 houses.

The preferred potential development area options are to the East of Wooler, which can supply 380 housing units, and/or to the North East of Wooler, which can supply 200 housing units. The alternative potential development area option is to the North West of Wooler, which could supply 380 housing units (Table 5-11).

Wooler has the potential to develop 2.086 ha of employment land.

Foul flows from development within Wooler will drain to Wooler WwTW which is situated to the north east of Wooler. Wooler WwTW discharges treated effluent into Wooler Water, a tributary of the River Till.

TABLE 5-11: POTENTIAL DEVELOPMENT AREA OPTIONS IN WOOLER

Settlement Area	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Wooler	Scenario 1 380 Scenario 2 280	East	Preferred	380	95	95	95	95	2.086
		North East	Preferred	200	50	50	50	50	
		North West	Additional/ Alternative	380	95	95	95	95	

WCS Assessment Summary

Table 5-12 provides a summary of the WCS site assessment for each of the potential development area options. The 2020 sewer and surface water capacity factors were not modelled by NW. Figure 5-6 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Wooler's water resource is supplied by the Berwick and Fowberry WRZ, which is abstracted from groundwater sources. NW's WRMP states that at present, the Berwick and Fowberry WRZ has significant licensed surplus supply, however there is uncertainty in the sustainable volume of water available from the groundwater sources. The Environment Agency Review of Consents may lead to a reduction in abstraction license in the Berwick and Fowberry WRZ, causing a significant reduction in deployable output for this WRZ after 2020 (see Section 4.4.2). Careful consideration should be given to the siting of some types of development in this area to ensure the adequate protection of existing abstraction sources. NW must be consulted on the water supply for all proposed development in Wooler and water efficiency options are considered.
- Wooler WwTW currently has limited headroom. NW are currently monitoring the flows at this works to assess the impact of a surface water removal project, this data will confirm actual headroom available. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- The North East potential development area option and SHLAA site 1091 in the East potential development area option are within close proximity of the Wooler WwTW

and NW would object to the development of the site. Therefore development should be steered to the south of the potential development area option or alternative potential development area options progressed for this settlement.

- The North East potential development area option and SHLAA sites 1988, 1091 and 1203 in the East potential development area option are located within Flood Zone 2. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-12: WOOLER SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
East	Berwick and Fowberry WRZ	Wooler WwTW	Tributary of the River Till GB102021072930	· **Combined sewer** (225 - 375mm) drains north to the WwTW.		-	-	Part of the site is near to a WwTW and NW would object to the development of the site.	SHLAA 1088, 1091 and 1203 FZ 2	Y	High	High		
North East				· **Combined sewer** (300mm) This location is on the west side of Wooler Water, therefore the site will need to utilise the combined sewer which crosses the river to the southeast of the site, which may limit capacity.		-	-	A Water Main crosses the site and NW would require it to be diverted or placed within a suitable easement. The site is also near to a WwTW and NW would object to the development of the site.	SHLAA 1299 FZ 2	Y	High	High		
North West				· **Foul sewer** (150mm) This location is on the west side of Wooler Water, therefore the site will need utilise the combined sewer which crosses the river to the southeast of the site, which may limit capacity. ·**SW sewer** (150mm) discharges to a tributary of the Humbleton Burn.		-	-		FZ 1	Y	High	High		
Employment Area B11				· **Combined sewer** (300mm) This location is on the west side of Wooler Water, therefore the sewer will need utilise the combined sewer which crosses the river to the southeast of the site, which may limit capacity.		-	-	-	FZ 1	Y	High	High		

5.3.7 ***Rest of Delivery Area***

Overview of proposed development

There are two scenarios for development in the rest of North Delivery Area; Scenario 1 has a dwellings target of 100 houses and Scenario 2 has a target of 1100 houses.

The Scenario 1 development target of 100 dwellings could be incorporated into the settlement areas of Norham, Cornhill and Scremerston (Table 5-13). Where the total proposed housing units for each strategic development area option is greater than the dwellings target, the dwellings target has been assessed. Where it is less than the dwellings target, the total proposed housing unit has been assessed. There are no planned employment opportunities in this settlement area.

TABLE 5-13: POTENTIAL DEVELOPMENT AREA OPTIONS IN REST OF NORTH DELIVERY AREA

Settlement Area	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Rest of North Delivery Area	Scenario 1 100	Norham	-	50	12	12	13	13	N/A
		Cornhill on Tweed	-	150	37	37	38	38	
		Scremerston	-	250	62	62	63	63	
		Whittingham	-	40	10	10	10	10	
		Glanton	-	40	10	10	10	10	
	Scenario 2 1100	Acklington Amble (within Warkworth Parish) Warkworth Christon Bank Cornhill on Tweed Eglingham Ellingham Embleton Felton Glanton Hipsburn Lesbury Longframlington Longhoughton Lowick Lucker Millfield Newton on the Moor Norham Powburn Rennington Rock Scremerston Shilbottle South Charlton	-	1100	275	275	275	275	

WCS Assessment Summary

Table 5-14 provides a summary of the WCS site assessment for each the potential development area option. Figures 5-7, 5-8, 5-9, 5-10 and 5-11 show the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

The potential development option information for Rest of North Delivery Area Scenario 2 was not available for assessment at the time of publication of the Final Report. Once

available, this information will be assessed separately and included as an addendum to the Final Report.

Infrastructure Recommendations

- Norham, Cornhill on Tweed and Scremeston are within the Berwick and Fowberry WRZ, where water is abstracted from groundwater sources. NW's WRMP states that at present, the Berwick and Fowberry WRZ has significant licensed surplus supply, however there is uncertainty in the sustainable volume of water available from the groundwater sources. The Environment Agency Review of Consents may lead to a reduction in abstraction license in the Berwick and Fowberry WRZ, causing a significant reduction in deployable output for this WRZ after 2020 (see Section 4.4.2). Careful consideration should be given to the siting of some types of development in this area to ensure the adequate protection of existing abstraction sources. NW must be consulted on the water supply for all proposed development in the Norham, Cornhill on Tweed and Scremeston, and water efficiency options are considered.
- Cornhill WwTW currently has no headroom available, therefore the works may require an upgrade to accommodate foul flows from the new development. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- The Scremerston potential development area option has a 2020 sewer capacity factor of 4 and 5, which suggests that the development is likely to exacerbate the predicted hydraulic performance issue. This potential development area option also has a 2020 surface water capacity factor of 3, 4 and 5. Further investigation and possible infrastructure upgrades may be required before development can commence in this area.
- The Cornhill on Tweed potential development area option is near to Cornhill WwTW and NW would object to the development of the site. Therefore alternative potential development area options should be progressed for this settlement area.
- The SHLAA site 1074 in Norham and SHLAA site 118 in Whittingham are located within Flood Zone 3a. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All development sites, except Glanton, are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-14: REST OF NORTH DELIVERY AREA SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Norham	Berwick and Fowberry WRZ	Norham Ww TW	River Tweed GB650301440000	· **Combined sewer** (375mm - 450mm) Foul flows from all development in Norham will drain to Norham Ww TW via the existing combined sewers subject to capacity.		-	-		SHLAA 1074 FZ 3a	Y	High	High		
Cornhill on Tweed		Cornhill Ww TW		· **Combined sewer** (150mm) Foul flows from all development in Cornhill on Tweed will drain to Cornhill Ww TW via the existing combined sewer, subject to capacity.		-	-	SHLAA 1233 and 1234 - The site is near to a Ww TW and NW would object to the development of the site.	FZ 1	SHLAA 1058 and 1188	High	Very High		
Scremerston		Berwick Ww TW		· **Combined sewer** (140mm) Foul flows from all development in Scremerston will drain north to Berwick Ww TW via the existing combined sewer, subject to capacity.		4, 5	3, 4, 5	SHLAA 1168 - A Public Sewer crosses the site and NW would require it to be diverted or placed within a suitable easement. The site is also near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	FZ 1	Y	High	High		
Whittingham	Kielder WRZ	Whittingham Ww TW	River Aln GB103022076310	· **Combined sewer** (300mm) Foul flows from all development in Whittingham will drain to Whittingham Ww TW via the existing combined sewer, subject to capacity. Developments to the south of the River Aln would require utilisation of the combined sewer which crosses the river.		-	-		SHLAA 118 – FZ 3a	SHLAA 116 and 118	High	High		
Glanton		Glanton Ww TW	A Tributary of the River Aln GB103022076310	· **Combined sewer** (150mm) Foul flows from all development in Glanton will drain to Glanton Ww TW via the existing combined sewer, subject to capacity		-	-		FZ 1		High	High		

5.4 Central Northumberland Delivery Area

5.4.1 *Hexham*

Overview of proposed development

There are two scenarios for development in Hexham; Scenario 1 has a dwellings target of 900 houses and Scenario 2 has a target of 720 houses.

The alternative/additional potential development area options are to the West of Hexham, which can accommodate 900 houses, to the East of Hexham, which can supply 275 houses, to the South West, which can accomodate 400 houses and to the North, which can accomodate 300 houses (Table 5-15).

Hexham has the potential to develop 19.325 ha of employment land.

Foul flows from development within Hexham will drain to Hexham WwTW which is situated to the east of Hexham, between an industrial area and the River Tyne at Anickgrange Haugh. Hexham WwTW discharges treated effluent into the River Tyne.

TABLE 5-15: POTENTIAL DEVELOPMENT AREA OPTIONS IN HEXHAM

Settlement Area	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Hexham	Scenario 1 900 Scenario 2 720	West	Additional/ Alternative	900	225	225	225	225	19.325
		East	Additional/ Alternative	275	69	69	69	68	
		South West	Additional/ Alternative	400	100	100	100	100	
		North	Additional/ Alternative	300	75	75	75	75	
		Acomb	Other Key Site	250	62	62	63	63	

WCS Assessment Summary

Table 5-16 provides a summary of the WCS site assessment for the potential development area options. Figure 5-12 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- The sewer network in the West, East and South West potential development area options have a historic record of sewer flooding, as well as a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issues. SHLAA site 2467 in Acomb also has a 2020 sewer capacity factor of 5. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.

- The North, Employment Area North, Employment Area E20, Employment Area E08 and East Hexham potential development area options located in Flood Zone 2 and 3. SHLAA sites 2467 and 2593 in Acomb are located within Flood Zone 3a. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All development sites, except South West, are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-16: HEXHAM SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
West and Employment Area (2ha)	Kielder WRZ	Hexham WwTW	River Tyne GB103023075801	· **Combined sewer** (150-225mm) This site is south of the River Tyne and requires the use of the 375mm diameter pumped sewer and syphon which crosses the River Tyne to Hexham WwTW, which may limit capacity.	Sewer flooding has been reported to the southeast of potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	5	-		FZ 1	Y	High	Very High		
East				· **Foul sewer** (150mm) This site is south of the River Tyne and requires the use of the 375mm diameter pumped sewer and syphon which crosses the River Tyne to the WwTW, which may limit capacity. · **SW sewer** discharges into an unnamed watercourse that discharges to the River Tyne.	Sewer flooding has been reported to the west of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	5	-		FZ 1	Y	High	High		
South West				· **Foul sewer** (150mm) connects to a combined sewer system. This site is south of the River Tyne and requires the use of the 375mm diameter pumped sewer and syphon which crosses the River Tyne to the WwTW, which may limit capacity ·**SW sewer** (600mm) discharges to either the Cockshaw Burn to the north or the Halgut Burn to the east.	Sewer flooding has been reported in the centre of Hexham, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	SHLAA 2644 - 5	SHLAA 2644 - 3		FZ 1		High	High		
North				· **Combined sewer** (150mm) This site is located north of the River Tyne and close to the Hexham WwTW, therefore it does not utilise the pumped sewer and syphon which crosses the River Tyne.		-	-		FZ 2 & 3	Y	High	Very High		
Employment Area North (2ha)				· **Combined sewer** (150mm) This site is located north of the River Tyne and close to the Hexham WwTW, therefore it does not utilise the 375mm diameter pumped sewer and syphon which crosses the River Tyne.		-	-	-	FZ 2 & 3	Y	High	High		
Employment Area E20				· **Combined sewer** (450mm) This site is south of the River Tyne and requires the use of the 375mm diameter pumped sewer and syphon which crosses the River Tyne to Hexham WwTW, which may limit capacity.		-	-	-	FZ 2 & 3	Y	High	High		
Employment Area E08 and East Hexham (8ha)				· **Combined sewer** (180mm) These employment sites are adjacent to Hexham WwTW.		-	-	-	FZ 2 & 3	Y	High	Very High		
Acomb				· **Combined sewer** (150mm-225mm) The site to the north of Acomb is north of the Red Burn River. Acomb is at the top end of the sewer network and drains to Hexham WwTW. Employment Area E15 is to the west of Acomb.		SHLAA 2467 - 5	-		SHLAA 2467 and 2593 FZ 3a	Y	High	High		

5.4.2 *Morpeth*

Overview of proposed development

There are four scenarios for development in Morpeth; 1500 dwellings, 2000 dwellings, 2100 dwellings and 2500 dwellings.

The preferred potential development area options are to the North of Morpeth, which can accommodate 1000 houses and to the East of Fairmoor, which can provide 250 houses. The development target shortfall from the scenarios could be made up by using a combination of the additional/alternative options and / or other key sites (Table 5-17).

Morpeth has the potential to develop 22.845 ha of employment land.

Foul flows from development within Morpeth will drain to Morpeth WwTW which is situated to the east of Morpeth at Parish Haugh. Morpeth WwTW discharges treated effluent into the River Wansbeck.

TABLE 5-17: POTENTIAL DEVELOPMENT AREA OPTIONS IN MORPETH

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Morpeth	Scenario 1 1500 Scenario 2 2000 Scenario 3 2100 Scenario 4 2500	North	Preferred	1000	250	250	250	250	22.845
		East Fairmoor	Preferred	250	62	62	63	63	
		South West	Additional/ Alternative	450	112	112	113	113	
		South East	Additional/ Alternative	360	90	90	90	90	
		West	Additional/ Alternative	800	200	200	200	200	
		North East	Additional/ Alternative	430	107	107	108	108	
		Pegswood	Other Key Sites	450	112	112	113	113	N/A
		Hepscott	Other Key Sites	200	50	50	50	50	

WCS Assessment Summary

Table 5-18 provides a summary of the WCS site assessment for the potential development area options. Figure 5-13 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- The sewer network in the South West and Employment Area D04 potential development area options have a historic record of sewer flooding. The South West potential development area option also has a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The SHLAA site 3073 in the West potential development area option is near to Morpeth WwTW and NW would object to the development of the site. Therefore development should be steered to the south of the potential development area

option or alternative potential development area options progressed for this settlement.

- The North, South West, and West potential development area options are located in Flood Zone 3a. The North East potential development area option is located within Flood Zone 2 and 3. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- The superficial deposits at East Fairmoor, South East and Pegswood potential development area options are highly permeable, therefore infiltration SuDS are unlikely to be suitable are this location. Local site investigations would be required to assess SuDS options prior to development.
- Employment area D04 is located within SPZ 1, and therefore infiltration SuDS are unlikely to be suitable in this location except for clean roof runoff. Local site investigations would be required to assess SuDS options prior to development located within any SPZ.
- Hepscott WwTW currently has no headroom available, therefore the works may require an upgrade to accommodate foul flows from the new development. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. However, this is likely to be achievable within current best technology. NW would consider this possibility as part of a potential feasibility study.
- Pegswood WwTW currently has limited headroom available, therefore the works may require an upgrade to accommodate foul flows from the new development. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. However, this works is at high risk as it is close to conventional treatment limits, therefore the discharge from this works will require modelling between the Environment Agency and NW. NW would consider this possibility as part of a potential feasibility study.
- The Pegswood potential development area option is located on superficial deposits with a low permeability, and therefore infiltration SuDS are unlikely to be suitable are this location. Local site investigations would be required to assess SuDS options prior to development.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-18: MORPETH SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
North	Kielder WRZ	Morpeth Ww TW	River Wansbeck GB103022076980	· **Combined sewer** (150-225mm) drains south and east to connect with Morpeth Ww TW.		-	-		SHLAA 3397 FZ 3a	Y	High	High	SPZ 3	
East Fairmoor				**Private STW**		N/A	N/A		FZ 1	Y	High	Low	SPZ 3	Infiltration SuDS may not be possible due to geology.
South West				· **Foul sewer** (150-225mm) drains north through Loansdean and High Church to connect to a combined sewer (300mm), which continues east through Morpeth to the Ww TW. · **SW sewer** (225mm)	Sewer flooding has been reported in High Church, therefore there may be a risk of sewer flooding and/or potential capacity constraints at this location.	3, 5	SHLAA 3067 - 5		SHLAA 3290 FZ 3a	Y	High	High	SPZ 3	
South East				· **Combined sewer** (225-375mm) drains north through Stobhillgate and Allery Banks, before connecting to Morpeth Ww TW.		3	-		FZ 1	Y	High	Low	SPZ 3	Infiltration SuDS may not be possible due to geology.
West and Employment Area (9ha)				· **Foul sewer** (150mm) drains south to connect to a 300mm diameter combined sewer which continues east through Morpeth to the Ww TW.		-	-	SHLAA 3073 - A Water Main crosses the site and NW would require it to be diverted or placed within a suitable easement. The site is also near to a Ww TW and NW would object to the development of the site.	SHLAA 3073 FZ 3a	Y	High	Very high	SPZ 3	
North East and Employment Area (9ha)				Although this site is close to Morpeth Ww TW, it is located to the north of the How Burn, which may require new infrastructure and a new river crossing in order to connect to the Ww TW.		-	-		FZ 2&3	Y	High	Very High	SPZ 3	
Employment Area D02				· **Foul sewer** (525mm) connects to a combined sewer (825mm) at Coopie's Lane and drains north to Morpeth Ww TW.		-	-	-	FZ 1	Y	High	Very High	SPZ 1	Infiltration to ground may be restricted for some development
Employment Area D04				· **Foul sewer** (225mm) From the data provided, it is unclear whether this site has its own exiting Ww TW or if the site connects to the foul sewer system to the west of the A1. The foul sewer drains east through Morpeth Common to connect to a combined sewer along the A197 in high Church.	Sewer flooding has been reported in High Church, therefore there may be a risk of sewer flooding and/or potential capacity constraints at this location.	-	-	-	FZ 1	Y	High	High	SPZ 3	
Employment Areas D13 and D21				· **Foul sewer** (150mm) The foul sewer drains south to connect to a combined 300mm diameter sewer, which continues east through Morpeth to the Ww TW.		-	-	-	FZ 1	Y	High	Low	SPZ 3	

TABLE 5-18: MORPETH SITE ASSESSMENT

Potential development area option	Water Resources	Overall Ww TW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Hepscott		Hepscott Ww TW	Hepscott Burn GB103022076230	· **Combined sewer** (150mm) The whole of Hepscott drains to a dual combined sewer system, one pipe has a 300mm diameter and the other increases from a 650mm pipe to a 1200mm pipe. The dual sewer runs parallel to the Hepscott Burn and connects to Hepscott Ww TW.		-	-		FZ 1	Y	High	High		
Pegswood		Pegswood Ww TW	Bothal Burn GB103022077030	· **Foul sewer** (150mm) connects to a 225mm combined sewer, which drains to Pegswood Ww TW. · **SW sewer** (375mm) discharges north to a tributary of the Bothal Burn.		-	-		FZ 1	SHLAA 3019 - Y	High	Low		Infiltration SuDS may not be possible due to geology.

5.4.3 *Prudhoe*

Overview of proposed development

There are two scenarios for development in Prudhoe; Scenario 1 has a dwellings target of 1000 houses and Scenario 2 has a target of 860 houses.

The preferred potential development area options are to the South East, which can accommodate 450 houses and Central Prudhoe, which can accommodate 300 houses and the additional/alternative potential development area options and/or other key sites would be required to make up the total dwellings targets (Table 5-19).

Prudhoe has the potential to develop 11.594 ha of employment land.

Foul flows from development within Prudhoe will drain to Howdon WwTW which is situated on the north bank of the River Tyne in North Tyneside. Howdon WwTW discharges treated effluent into the tidal River Tyne.

TABLE 5-19: POTENTIAL DEVELOPMENT AREA OPTIONS IN PRUDHOE

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Prudhoe	Scenario 1 1000 Scenario 2 860	South East	Preferred	450	112	112	113	113	11.594
		Central	Preferred	300	75	75	75	75	
		West	Additional/ Alternative	400	100	100	100	100	
		North of Town Centre	Other Key sites	150	37	37	38	38	
		Eastwood School	Other Key sites	100	25	25	25	25	
		Mickley	Other Key sites	150	37	37	38	38	

WCS Assessment Summary

Table 5-20 provides a summary of the WCS site assessment for the potential development area options. Figure 5-14 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Howdon WwTW currently has limited headroom.
- The sewer network in the South East, West, Eastwood School and Employment Area E12 potential development area options have a historic record of sewer flooding. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.

- The South East, Central, West, and Mickley potential development area option has a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Eastwood School has a 2020 sewer capacity factor of 4, which suggests that the development could create a hydraulic performance issue.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
  - Further investigation and possible infrastructure upgrades may be required before development can commence.
- The Eastwood School potential development area option has a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required.
- The Eastwood School potential development area option is near to a Sewer Pumping Station (SPS), therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.
- The Employment Area E12 is located in Flood Zone 2 and 3. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-20: PRUDHOE SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
South East	Kielder WRZ	Howdon WwTW	River Tyne (Tidal)	· **Foul sewer** (150mm) connects to the combined sewer system (300mm). The western side of the site is close to Ovingham Bridge, where the sewers connect and drain eastwards towards Howdon.	Sewer flooding has been reported to the north of Prudhoe, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	SHLAA 2494 - 5	-		FZ 1	Y	Moderate	High		
Central				· **Combined sewer** (225mm) drains northwards through Prudhoe to Ovingham Bridge, where the sewers connect and drain towards Howdon.		5	1, 2		FZ 1	SHLAA 2550 - Y	High	High		
West				· **Foul sewer** connects to the combined sewer system. The combined sewer drains northwards through Prudhoe to Ovingham Bridge, where the sewers connect and drain towards Howdon. · **SW sewer** discharges to the Otter Burn.	Sewer flooding has been reported to the west of Prudhoe, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	5	-		FZ 1	Y	High	High		
North of Town Centre				· **Combined sewer** (225mm) drains northwards to Orchard Hill and east to Ovingham Bridge, where the sewers connect and drain towards Howdon.		-	-	-	FZ 1	Y	High	High		
Eastwood School				· **Foul sewer** (150mm) connects to the combined sewer system (300mm). The western side of the site is close to Ovingham Bridge, where the sewers connect and drain eastwards towards Howdon.	Sewer flooding has been reported to the southwest of the settlement site in West Wylam, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	4	5	The site is near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	FZ 1	Y	High	High		
Employment Area E12				· **Foul sewer** (150mm) connects to the combined sewer system (300mm). The western side of the site is close to Ovingham Bridge, where the sewers connect and drain eastwards towards Howdon.	Sewer flooding has been reported to the south of the development site, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	-	-	-	FZ 2 & 3	Y	High	Very High		
Employment Area E17 Eltringham				· **Combined sewer** (225mm) drains west and then north through Prudhoe to Ovingham Bridge, where the sewers connect and drain towards Howdon.		-	-	-	FZ 1	Y	High	Very High		
Mickley				· **Combined sewer** (225mm) The whole of Mickley drains to a combined sewer, which drains eastward to Prudhoe and on to Howdon WwTW.		5	-		FZ 1	Y	High	Very high		

5.4.5 *Corbridge*

Overview of proposed development

There are two scenarios for development in Corbridge; Scenario 1 has a dwellings target of 300 houses and Scenario 2 has a target of 240 houses.

The preferred potential development area options in the North of the settlement area, which can accommodate 260 housing units and North East of the settlement area, which can accommodate 36 housing units (Table 5-21). There are no planned employment opportunities in this settlement area.

Foul flows from development within Corbridge will drain to Broomhaugh WwTW which is situated on the south bank of the River Tyne, to the east of Broomhaugh and the immediate west of the A68. Broomhaugh WwTW serves Corbridge, Riding Mill and Painshawfield / Park Estate discharges treated effluent into the River Tyne.

TABLE 5-21: POTENTIAL DEVELOPMENT AREA OPTIONS IN CORBRIDGE

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Corbridge	Scenario 1 300 Scenario 240	North	Preferred	260	65	65	65	65	N/A
		North East	Preferred	36	9	9	9	9	
		North North East	Additional/ Alternative	200	50	50	50	50	
		East	Additional/ Alternative	300	75	75	75	75	

WCS Assessment Summary

Table 5-22 provides a summary of the WCS site assessment for the potential development area options. Figure 5-15 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- The North East and North North East potential development area options, and the SHLAA site 2471 in the North potential development area option, have a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. The East potential development area option has a 2020 sewer capacity factor of 4, which suggests that the development could create a hydraulic performance issue.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
  - Further investigation and possible infrastructure upgrades may be required before development can commence.
- The North East and North North East potential development area options, and the SHLAA site 2347 in the North potential development area option, have a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required.

- All development sites, except North North East, are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-22: CORBRIDGE SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
North	Kielder WRZ	Broomhaugh Ww TW	River Tyne GB103023075801	· **Foul** (150mm) connects to a combined sewer system. · **SW sewer** discharges to the River Tyne.		SHLAA 2471 - 5	SHLAA 2347 - 5		FZ 1	Y	High	Very high		
North East				· **Foul** (225mm) connects to a combined sewer system. · **SW sewer** (225mm) discharges to the River Tyne.		5	5		FZ 1	Y	High	High		
North North East				· **Foul** (150mm) connects to a combined sewer system. · **SW sewer** discharges to the River Tyne.		5	5		FZ 1		High	High		
East				· **Foul** (225mm) connects to a combined sewer system. · **SW sewer** (225mm) discharges to the River Tyne.		4	-		FZ 1	Y	High	High		

5.4.7 ***Ponteland***

Overview of proposed development

There are two scenarios for development in Ponteland; Scenario 1 has a dwellings target of 850 houses and Scenario 2 has a target of 640 houses.

The preferred potential development area options are to the South East and North West of Ponteland. Alternative potential development area options are located to the South, North and West of Darras Hall (Table 5-23).

Ponteland has the potential to develop 3 ha of employment land.

Foul flows from development within Ponteland will drain to Howdon WwTW which is situated on the north bank of the River Tyne in North Tyneside. Howdon WwTW discharges treated effluent into the tidal River Tyne.

TABLE 5-23: POTENTIAL DEVELOPMENT AREA OPTIONS IN PONTELAND

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Ponteland	Scenario 1 850 Scenario 2 640	South East	Preferred	600	150	150	150	150	3
		North West	Preferred	300	75	75	75	75	
		South of Darras Hall	Additional/ Alternative	850	212	212	213	213	
		North of Darras Hall	Additional/ Alternative	850	212	212	213	213	
		West	Additional/ Alternative	850	212	212	213	213	
		West of Darras Hall	Additional/ Alternative	850	212	212	213	213	
		Callerton Lane	Other Key Sites	180	45	45	45	45	

WCS Assessment Summary

Table 5-24 provides a summary of the WCS site assessment for the potential development area options. Figure 5-16 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Howdon WwTW currently has limited headroom available. Surface water removal schemes may need to be identified.
- The sewer network in the South of Darras Hall and West potential development area options have a historic record of sewer flooding. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The South East and North of Darras Hall potential development area options are near to a Sewer Pumping Station (SPS), therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.
- The SHLAA site 3010 in the South East potential development area option is located within Flood Zone 2. The SHLAA site 3176 in the South East potential development area option is located within Flood Zone 3a. The SHLAA site 3427 in the North West potential development area option is located within Flood Zone 3a.

SHLAA sites 3159 and 3037 in North of Darras Hall is located within Flood Zone 3a. The East potential development area option is located in Flood Zone 2 and 3. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.

- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-24: PONTELAND SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
South East and Employment Area (3ha)	Kielder WRZ	Howdon WwTW	River Tyne (tidal)	· **Foul sewer** (225-300mm) connects to a combined sewer system (400mm), which serves the whole of Ponteland and Darras Hall and drains eastwards to Howdon WwTW. · **SW sewer** (300mm) discharges into either the River Pont or the Fairney Burn.		-	-	SHLAA 6838 - The site is also near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	SHLAA 3010 – FZ 2 SHLAA 3176 – FZ 3a	Y	High	High		
North West				This location is currently not severed by a sewer network, therefore further discussion with NW is required for this site. New infrastructure may be required to connect to the existing sewer network in Ponteland to the southeast.		-	-		SHLAA 3427 – FZ 3a	Y	High	High		
South of Darras Hall				· **Foul sewer** (150-300mm) drains north through Darras Hall and eventually connects to a combined sewer system (400mm) in Ponteland , and drains eastwards to Howdon WwTW. · **SW sewer** discharges into River Pont.	Sewer flooding has been reported to the north of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	-	-		FZ 1	Y	High	Very High		
North of Darras Hall				· **Foul sewer** (225mm) This location is north of the River Pont, which restricts connections to the existing network. The foul sewer connects to a combined sewer system (400mm), which serves the whole of Ponteland and Darras Hall and drains eastwards to Howdon WwTW.		-	-	SHLAA 6864 - The site is near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	SHLAA 3159 and 3037 – FZ 3a	Y	High	High		
West				· **Foul sewer** (150mm) connects to a combined sewer system (400mm), which serves the whole of Ponteland and Darras Hall and drains eastwards to Howdon WwTW. · **SW sewer** (150mm) discharges into River Pont.	Sewer flooding has been reported to the southeast of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	-	-		FZ 1	Y	High	High		
West of Darras Hall				· **Foul sewer** (150mm) There is an existing foul sewer that runs from Medburn (to the west) through the option site and eastwards through Darras Hall.		-	-		FZ 1	Y	High	Very High		
East				· **Foul sewer** (150mm) connects to a combined sewer system (400mm), which serves the whole of Ponteland and Darras Hall and drains eastwards to Howdon WwTW. · **SW sewer** (150mm) discharges into River Pont.		-	-		FZ 2 & 3	Y	High	Very High		
Callerton Lane				· **Foul sewer** (150mm) connects to a combined sewer system (400mm), which serves the whole of Ponteland and Darras Hall and drains eastwards to Howdon WwTW. · **SW sewer** (150mm) discharges into Fairney Burn.		-	-		FZ 1	Y	High	High		

5.4.8 ***Rest of Central Delivery Area***

Overview of proposed development

There are two scenarios for development in the rest of the Central Delivery Area; Scenario 1 has a dwellings target of 1720 houses and Scenario 2 has a target of 1120 houses.

The development target could be accommodated by a combination of 19 settlement areas (Table 5-25). The total Employment land available is 24.51 ha, however the following employment sites have private WwTWs, therefore they have not been included in the assessment:

- E32 Newlands - Marley Tile Co. (6.259 ha)
- D12 Whitehouse Business Centre (1.011 ha)
- E30 Bywell - Home Farm (0.090 ha)

TABLE 5-25: POTENTIAL DEVELOPMENT AREA OPTIONS IN REST OF CENTRAL DELIVERY AREA

Settlement Areas	Dwellings Target	Potential development area options	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
				2011-2016	2016-2021	2021-2026	2026-2031	
Rest of Central Delivery Area	Scenario 1 1720 Scenario 2 1120	Stocksfield	300	75	75	75	75	17.15 (excluding E32, D12 and E30)
		Wylam	80	20	20	20	20	
		Ovingham	80	20	20	20	20	
		Horsley	60	15	15	15	15	
		Hedley on the Hill	30	7	7	8	8	
		Heddon on the Wall	30	7	7	8	8	
		New castle Airport	-	-	-	-	-	
		Stannington Hospital Site	330	82	82	83	83	
		Stannington	100	25	25	25	25	
		Longhirst	75	19	19	19	18	
		Whalton	55	14	14	14	13	
		Stannington Station	130	32	32	33	33	
		Tranw ell Woods	40	10	10	10	10	
		Longhorsley	180	45	45	45	45	
		Scots' Gap	50	12	12	13	13	

WCS Assessment Summary

Table 5-26 provides a summary of the WCS site assessment for the potential development area options. Figures 5-17, 5-18, 5-19, 5-20 and 5-21 show the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Howdon WwTW currently has limited headroom available. Surface water removal schemes may need to be identified.

- Hedley on the Hill WwTW was not assessed by NW, however when growth is certain in this potential development area option, NW will commence their investment procedure. If a new hydraulic consent is required at these works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- Heddon on the Wall WwTW, Longhirst WwTW and Scots Gap WwTW currently have limited headroom available, therefore these works may require an upgrade to accommodate foul flows from the new development. If a new hydraulic consent is required at these works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- NW have confirmed that Stannington St Mary's WwTW has been abandoned and pumped to Cramlington WwTW.
- Tranwell WwTW is a package plant located in private garden and NW have confirmed that the works cannot be upgraded.
- Whalton WwTW currently has foul headroom for 80 units available. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- The sewer network in the Heddon on the Wall potential development area option has a historic record of sewer flooding. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The Wylam, Ovingham and Stannington potential development area options, as well as SHLAA site 2463 in Stocksfield and SHLAA sites 2392 and 6825 in Horsley have 2020 sewer capacity factors of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue.
    - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
    - Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The Hedley on the Hill potential development area option is within close proximity of Hedley on the Hill WwTW and Scots Gap potential development area option is within close proximity of Scots Gap WwTW. NW would object to the development of these sites, therefore alternative potential development area options should be progressed for this settlement area.
- SHLAA 6814 in Longhirst is within 200m of Longhirst WwTW and SHLAA site 6795 in Longhorsley is within 200 metres of Longhorsley WwTW. NW would require odour assessment as part of the planning application and their response to the application would depend on the odour assessment outcome. Therefore alternative potential development area options should be considered for this settlement area.
- SHLAA 2463 in Stocksfield, SHLAA 2508 in Wylam, SHLAA 3191 in Stannington and SHLAA 6171 in Longhirst are located in Flood Zone 3a. SHLAA 2440 in Ovingham is located within Flood Zone 2. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under

the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.

- All development sites, except Hedley on the Hill, Whalton and Scots Gap, are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.
- The Longhorsley potential development area option is located on superficial deposits with a low permeability, and therefore infiltration SuDS are unlikely to be suitable are this location. Local site investigations would be required to assess SuDS options prior to development.

TABLE 5-26: REST OF CENTRAL DELIVERY AREA SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Stocksfield and Employment Area E27	Kielder WRZ	Broomhaugh Ww TW	River Tyne GB103023075801	· **Combined sewer** (225mm) The whole of Stockfield drains to a 450mm diameter combined sewer, which drains westward to the Broomhaugh Ww TW.		SHLAA 2463 - 5	-		SHLAA 2463 – FZ 3a	Y	High	High		
Wylam		How don Ww TW	River Tyne (tidal)	· **Combined sewer** (150-225mm) drains to a dual combined sewer, with one 250mm pipe and one 315mm diameter pipe. The sewers merge into a 305mm pipe upstream of the Horsley sewer connection. The whole of Wylam drains to a 150mm combined sewer, which drains westward to Ovingham. The combined sewer then crosses the River Tyne via a 375mm pipe, causing potential constriction to any new development north of the river. The sewer then drains eastward to Prudhoe and on to How don Ww TW.		5	-		SHLAA 2508 – FZ 3a	Y	High	High		
Ovingham				· **Foul sewer** (150mm) connects to a combined sewer system The local settlements of Ovington, Horsley and Wylam also drain to Ovingham via a combined sewer. The combined sewer then crosses the River Tyne via a 375mm diameter pipe. This may cause a potential constriction to any new development north of the river.		5	-		SHLAA 2440 – FZ 2	Y	High	High		
Horsley				· **Combined sewer** (150mm) The whole of Horsley drains to a combined sewer, which drains south and then westward to Ovingham. The combined sewer then crosses the River Tyne via a 375mm pipe. This may cause a potential constriction to any new development north of the river.		SHLAA 2392 and 6825 - 5	-		FZ 1	Y	High	High		
Newcastle Airport Expansion				· **Foul sewer** (300mm)		-	-	-	FZ 1	Y	High	High		
Hedley on the Hill		Hedley on the Hill Ww TW	River Tyne GB103023075700	· **Combined sewer** (225mm) There is a small drainage network to Hedley on the Hill Septic Tank, which is located to the northeast of the settlement area.		-	-	SHLAA 2041 - The site is near to a Ww TW and NW would object to the development of the site.	FZ 1		High	High		
Heddon on the Wall		Heddon on the Wall Ww TW	River Tyne	· **Combined sewer** (150-300mm) The whole of Heddon on the Wall drains to a combined sewer (225mm), which drains south to Heddon on the Wall Ww TW. This may cause a potential constriction to any new development in the settlement area.	Sewer flooding has been reported to the west of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	-	-		FZ 1	Y	High	High		
Stannington Hospital Site		Cramlington Ww TW	River Blyth GB103022077050			-	-		FZ 1	Y	High	High		

TABLE 5-26: REST OF CENTRAL DELIVERY AREA SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Stannington		Cramlington WwTW	River Blyth GB103022077050	· **Combined sewer** (150mm) The whole of Stannington drains to a pumping station to the south of the town via a combined sewer network. From the pumping station a combined sewer (increasing in diameter from 130mm to 300mm at Hartford Bridge) drains eastwards to the Cramlington WwTW.		5	-		SHLAA 3191 – FZ 3a	SHLAA 3527 - Y	High	High		
Longhirst		Longhirst WwTW	Longhirst Burn GB103022077030	· **Combined sewer** (100mm) drains south to Longhirst WwTW.		-	-	SHLAA 6814 - The site is within 200 metres of a WwTWs which by the nature of their function can produce odours which lead to customer complaints. Any development upon this site which NCC chooses to permit through the planning process should be supported by a full odour assessment. NW's response to the planning application would be dependent upon the outcome of the odour assessment.	SHLAA 6171 – FZ 3a	Y	High	High		
Whalton		Whalton WwTW	How Burn GB103022076940	· **Combined sewer** (150mm) The whole of Whalton drains to a 150mm diameter combined sewer, which drains south to Whalton WwTW.		-	-		FZ 1		High	High		
Stannington Station		Cramlington WwTW	River Blyth GB103022077050	· **Combined sewer**		-	-		FZ 1		High	High		
Tranwell Woods		Tranwell WwTW	-	· **Combined sewer**		-	-		FZ 1	Y	High	Very high		
Longhorsley		Longhorsley WwTW	River Coquet GB103022076550	· **Foul sewer** (150mm) The whole of Longhorsley drains to the Longhorsley WwTW, to the east of the settlement area. · **SW sewer** (150mm) discharges into either the Linden Burn or Paxtondean Burn.		-	-	SHLAA 6795 - The site is within 200 metres of a WwTW which by the nature of their function can produce odours which lead to customer complaints. Any development upon this site which NCC chooses to permit through the planning process should be supported by a full odour assessment. NW's response to the planning application would be dependent upon the outcome of the odour assessment.	FZ 1	Y	Moderate	Low		Infiltration SuDS may not be possible due to geology

TABLE 5-26: REST OF CENTRAL DELIVERY AREA SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Scots' Gap		Scots' Gap Ww TW	Middleton Burn GB103022076990	· **Combined sewer** (150-225mm) drains south to Scots' Gap Ww TW. A combined sewer from Cambo settlement to the West of Scots' Gap also drains to this Ww TW.		-	-	SHLAA 3000 - A Public Sewer crosses the site and NW would require it to be diverted or placed within a suitable easement. The site is also near to a Ww TW and NW would object to the development of the site.	FZ 1		High	High		

5.5 South East Northumberland Delivery Area

5.5.1 *Amble*

Overview of proposed development

There are two scenarios for development in Amble; Scenario 1 has a dwellings target of 740 houses and Scenario 2 has a target of 600 houses. The preferred potential development area option is to the South West of the settlement area, which can supply 740 housing units (Table 5-27).

Amble has the potential to develop 10.916 ha of employment land.

Foul flows from development within Amble will drain to Amble WwTW which is situated to the south of Amble, adjacent to Percy Drive. Amble WwTW discharges treated effluent into the North Sea via a sea outfall.

TABLE 5-27: POTENTIAL DEVELOPMENT AREA OPTIONS IN AMBLE

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Amble	Scenario 1 740 Scenario 2 600	South West	Preferred	740	185	185	185	185	10.916
		West	Alternative	740	185	185	185	185	
		South East	Alternative	740	185	185	185	185	
		Amble Boat Yard	Other Key Sites	127	32	32	32	31	

WCS Assessment Summary

Table 5-28 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-22 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW any historic sewer flooding.

Through consultation, the Environment Agency has advised that within Amble, minewater levels are rising from cessation of deep mine dewatering and are actively controlled locally to opencast coal sites/ quarrying.

Infrastructure Recommendations

- The sewer network in the West potential development area option has a historic record of sewer flooding, a 2020 sewer capacity factor of 5, and SHLAA site 13 has a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
  - Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- In the South West potential development area option, SHLAA 22 is near to Amble WwTW and NW would object to the development of the site. SHLAA 350 is within 300 metres of Amble WwTW and NW would require odour to be considered as part of site assessment. Therefore alternative potential development area options should be progressed for this settlement area.

- In the South East potential development area option, SHLAA sites 146 and 160 are near to Amble WwTW and NW would object to the development of the site. Therefore alternative potential development area options should be progressed for this settlement area.
- In the South East potential development area option, SHLAA 160 is located within Flood zone 2 and SHLAA 351 in the Amble Boat Yard is located in Flood Zone 3a. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- The South West, West and Employment Area A05 potential development area options are located on superficial deposits with a low permeability, and therefore infiltration SuDS are unlikely to be suitable are this location. Local site investigations would be required to assess SuDS options prior to development.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-28: AMBLE SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
South West	Kielder WRZ	Amble Ww TW	North Sea	· **Foul sewer** (225mm) connects to a combined sewer		3	1	SHLAA 22 - Part of the site is near to a Ww TW and NW may object to the development of the site. SHLAA 350 - The eastern corner of the site is within 300 metres of a Ww TW and NW would wish odour to be considered as part of site assessment.	FZ 1	Y	Moderate	Low		Infiltration SuDS may not be possible due to geology
West				· **Foul sewer** connects to a combined sewer · **SW sewer** discharges into the Guilders Burn.	Sewer flooding has been reported to the east of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	5	SHLAA 13 - 5		FZ 1	SHLAA 13 and 15 - Y	High	Low		Infiltration SuDS may not be possible due to geology
South East				· **Rising Main** (90mm) connects directly to the Ww TW.		3	1	SHLAA 146 and 160 - Part of the site is near to a Ww TW and NW may object to the development of the site.	SHLAA 160 – FZ 2	Y	Moderate	High		
Amble Boat Yard				· **Combined sewer** (300mm)		3	-		SHLAA 351 – FZ 3a	Y	High	Moderate		
Employment Area A08				· **Foul sewer** (225mm) · **SW sewer** (525mm) discharges into the Gut.		-	-		FZ 1	Y	High	Low		Infiltration SuDS may not be possible due to geology

5.5.2 ***Ashington***

Overview of proposed development

There are two scenarios for development in Ashington; Scenario 1 has a dwellings target of 1600 houses and Scenario 2 has a target of 1800 houses.

The preferred potential development area option is to the North East of Ashington, which can accommodate 1370 housing units and the additional/alternative potential development area options and /or other key sites would be required to make up the rest of the dwellings targets (Table 5-29).

Ashington has the potential to develop 29.005 ha of employment land.

Foul flows from development within Ashington will drain to Newbiggin WwTW which is situated to the south of Newbiggin-by-the-Sea and the east of North Seaton. Newbiggin WwTW discharges treated effluent into the North Sea via a long sea outfall.

TABLE 5-29: POTENTIAL DEVELOPMENT AREA OPTIONS IN ASHINGTON

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Ashington	Scenario 1 1600 Scenario 2 1800	North East	Preferred	1370	342	342	343	343	29.005
		West	Additional/ Alternative	780	195	195	195	195	
		ABT Line Option	Additional/ Alternative	-	-	-	-	-	
		Ashington Hospital	Other Key Sites	104	26	26	26	26	
		West of Wansbeck Road	Other Key Sites	110	27	27	28	28	

WCS Assessment Summary

Table 5-30 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-23 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Through consultation, the Environment Agency have advised that minewater levels are rising from cessation of deep mine dewatering and active mine water control is proposed for Ellington / Lynemouth to prevent polluting mine water discharges into the River Wansbeck.

Infrastructure Recommendations

- Newbiggin WwTW currently has surface water entering the network resulting in limited headroom for additional foul flows, therefore the source of infiltration will need to be investigated. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- The sewer network in the Employment Area F01 potential development area option has a historic record of sewer flooding. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.

- The West, Ashington Hospital and West of Wansbeck Road potential development area options have a 2020 sewer capacity factor of 5, and SHLAA site 5080 has a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
  - Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The North East and West potential development area options are near to a Sewer Pumping Station (SPS), therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.
- The South West, West and Employment Area A05 potential development area options are located on superficial deposits with a low permeability, and therefore infiltration SuDS are unlikely to be suitable are this location. Local site investigations would be required to assess SuDS options prior to development.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-30: ASHINGTON SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
North East	Kielder WRZ	New biggin Ww TW	North Sea	· **Combined sewer** (750-900mm) drains through Moorhouse Estate and southeast towards North Seaton before crossing the A189 to New biggin Ww TW.		3	-	SHLAA 5078 - The site is also near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	FZ 1	Y	High	High		
West				· **Foul sewer** (150mm) connects to the local combined sewer and drains south and east, through Ashington Park (900mm), before heading south through the Jubilee Industrial Estate (Employment Area F01). · **SW sewer** (375mm) discharges into the Wellhead Dean, a tributary of the River Wansbeck.		5	-	SHLAA 6755 and 6784 - The site is also near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	FZ 1	Y	Moderate	Low		Infiltration SuDS may not be possible due to geology
ABT Line Option				Local connections may be required to the exiting drainage network. Further discussion with NW is required.		-	-	-	FZ 1	Y	High	High		
Ashington Hospital				· **Combined sewer** (225mm) drains south and east to connect to the large combined sewer along the B1334.		SHLAA 5080 - 5	SHLAA 5080 - 5		FZ 1	Y	High	Low		Infiltration SuDS may not be possible due to geology
West of Wansbeck Road				· **Foul sewer** (150mm) drains east before connecting to the combined sewer through Jubilee Industrial Estate (Employment Area F01). · **SW sewer** (300mm) discharges into the Wellhead Dean, a tributary of the River Wansbeck.		5	3		FZ 1	Y	High	Low		Infiltration SuDS may not be possible due to geology
Employment Area F01				·**Combined sewer** (525mm) drains eastwards along the B1334, then northeast towards North Seaton before crossing the A189 to New biggin Ww TW.	Sewer flooding has been reported to the east of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	-	-	-	FZ 1	Y	High	High		
Employment Areas F02 and F12				·**Combined sewer** (225mm) drains northeast towards North Seaton before crossing the A189 to New biggin Ww TW. · **SW sewer** discharges into the River Wansbeck.		-	-	-	FZ 1	Y	High	High		
Employment Area F10				·**Foul sewer** (150mm) connects to the local combined sewer and drains south and east, through Ashington Park (900mm), before heading south through the Jubilee Industrial Estate (Employment Area F01). ·**Surface** (825mm) discharges into the Haydon Letch.		-	-	-	FZ 1	Y	High	Low		Infiltration SuDS may not be possible due to geology

TABLE 5-30: ASHINGTON SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Employment Area F11				·**Foul sewer** (150mm) connects to a combined sewer, which drains south, through Hirst, to connect with the large combined sewer (600-675mm) on the B1334. ·**SW sewer** (450mm) discharges into the lake in Queen Elizabeth II		-	-	-	FZ 1	Y	Moderate	High		

5.5.3 *Bedlington*

Overview of proposed development

There are two scenarios for development in Bedlington; Scenario 1 has a dwellings target of 1200 houses and Scenario 2 has a target of 1280 houses.

The preferred potential development area option is to the North of the settlement area, which can supply 860 housing units and the additional/alternative potential development area options and /or other key sites would be required to make up the rest of the dwellings target (Table 5-31). There are no planned employment opportunities in this settlement area.

Foul flows from development within Bedlington will drain to Cambois WwTW which is situated to the north of Cambois and south of North Seaton Colliery, immediately east of the A189 and north of a mineral railway. Cambois WwTW discharges treated effluent into the North Sea via a long sea outfall.

TABLE 5-31: POTENTIAL DEVELOPMENT AREA OPTIONS IN BEDLINGTON

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Bedlington	1200	North	Preferred	860	215	215	215	215	N/A
		North East	Additional/ Alternative	510	127	127	128	128	
		West and South West	Additional/ Alternative	550	137	137	138	138	
		North Cambois	Additional/ Alternative	450	112	112	113	113	
		South of Barrington	Other Key Sites	180	45	45	45	45	
		Broadway House Farm	Other Key Sites	103	25	26	26	26	

WCS Assessment Summary

Table 5-32 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-24 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- The sewer network in the North East and Broadway House Farm potential development area options have a historic record of sewer flooding. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The North East, West and South West and North Cambois potential development area options have a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Broadway House Farm has a sewer capacity of 4.

- If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
- Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.

- All development sites, except Broadway House Farm, are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-32: BEDLINGTON SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourses	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
North	Kielder WRZ	Cambois Ww TW	North Sea	·**Foul sewer** (225mm) connects to a combined sewer (375-400mm), which drains northeast to the Red Row Bedlington Pumping Station (875mm). It continues east to a pumping house and then northeast to Cambois Ww TW. ·**SW sewer** discharges north into an unnamed tributary of the Sleek Burn.		2, 3	-		FZ 1	SHLAA 5154 and 5158 - Y	Moderate	High		
North East				·**Combined sewer** (900mm) crosses the Sleek Burn River and connects to the pumping house. The sewer continues north to Cambois Ww TW.	Sewer flooding has been reported to the southwest of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	SHLAA 5156 - 5	3		FZ1	Y	High	High		
West and South West				·**Combined sewer** (225mm) drains to a 600mm combined sewer, which continues northwards parallel to the Green Burn. However, the diameter of this sewer reduces to 375mm as it gets towards the Willow Bridge Hotel, which may limit capacity. There is a 450mm overflow pipe into the Green Burn where the sewer capacity reduces. The sewer continues east to the Red Row Bedlington Pumping Station. ·**SW sewer** discharges into the Green Burn.		SHLAA 6773 and 6851 - 5	-		FZ 1	Y	High	High		
North Cambois				·**Combined sewer** (180mm)		5	1, 2		FZ 1	Y	High	High		
South of Barrington				·**Combined sewer** (525mm) drains north to the 750-900mm combined sewer that connects to the Red Row Bedlington Pumping Station. It continues east to a pumping house and then northeast to Cambois Ww TW.		3	-		FZ 1	Y	High	High		
Broadway House Farm				·**Foul sewer** connects to a 300mm combined sewer, which flows to the north of Millford South Road, and continues northeast to the A189. The pipe diameter then increases to 900mm and continues north through the North East development site and crosses the Sleek Burn River.	Sewer flooding has been reported to the northwest of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	4	1		FZ 1		High	High		

5.5.4 ***Blyth***

Overview of proposed development

There are two scenarios for development in Blyth; Scenario 1 has a dwellings target of 3480 houses and Scenario 2 has a target of 2860 houses.

The preferred potential development area options are to the South West of Newsham, which can accommodate 1075 houses and to the West of Blyth, which can supply 690 houses. The additional/alternative potential development area options would be required to make up the rest of the dwellings targets (Table 5-33).

Blyth has the potential to develop 227.472 ha of employment land.

Foul flows from development within Blyth will drain to Blyth WwTW which is situated in the northern part of Blyth on the south bank of the River Blyth at Cowpen. Blyth WwTW discharges treated effluent into the tidal River Blyth.

TABLE 5-33: POTENTIAL DEVELOPMENT AREA OPTIONS IN BLYTH

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Blyth	Scenario 1 3480 Scenario 2 2860	South West Newsham	Preferred	1075	269	269	269	268	227.472
		West	Preferred	690	172	172	173	173	
		Wellesley Home Site	Additional/ Alternative	390	97	97	98	98	
		Bebside	Additional/ Alternative	840	210	210	210	210	
		Bates Colliery Site	Additional/ Alternative	257	64	64	64	65	

WCS Assessment Summary

Table 5-34 provides a summary of the WCS site assessment for each of the potential development area options. Figures 5-24 and 5-25 show the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Through consultation, the Environment Agency has advised that the Coal Authority is actively managing the mine water levels at Bates, Blyth. The dewatering pumps are at capacity and mine water level is close to ground level in Blyth area, and gradients radiate out as far as Algernon, Cobalt Business Park North Tyneside. These gradients have been intercepted by the Seaton Burn with mine water discharging into the stream bed in the lower reach at Seaton Sluice. The Coal Authority are investigating this and have proposed drilling a new monitoring borehole at East Holywell.

The Environment Agency has anecdotal evidence of basement groundwater flooding in Blyth. Groundwater levels/ minewater levels are close to ground level at this location and could be higher if not pumped at Bates by the Coal Authority. Spring lines move according to rainfall and groundwater levels. This could cause local groundwater supported flooding. Groundwater inflows to sewers could be dependent on recharge of rain to groundwater.

Infrastructure Recommendations

- The sewer network in the Bates Colliery Site potential development area option has a historic record of sewer flooding. Further investigation and possible infrastructure

upgrades may be required in these areas before development can commence in this area.

- South West Newsham, Bebside and SHLAA site 4573 in Bates Colliery Site potential development area options have a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
  - Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The South West Newsham potential development area option has a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The South West Newsham, Wellesley Home Site and Bates Colliery Site potential development area options are near to a Sewer Pumping Station (SPS), therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.
- In the South West Newsham, Employment Areas C02 and C03, the south east parts of the Blyth Estuary Strategic Employment Area, the Commissioner's Quay and SHLAA 4575 in Bates Colliery Site are located within Flood Zone 2 and Flood Zone 3. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- The Bates Colliery Site potential development area option is located on superficial deposits with a low permeability, and therefore infiltration SuDS are unlikely to be suitable are this location. Local site investigations would be required to assess SuDS options prior to development.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-34: BLYTH SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
South West Newsham	Kielder WRZ	Blyth Ww TW	River Blyth GB103022077050	·**Combined sewer** (225-300mm) drains northeast towards Blyth harbour, before heading west to Blyth Ww TW.		5	5	SHLAA 4672 and 4647 - The site is also near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	SHLAA 4694 (FZ 3a & 3b) SHLAA 4672 & 4647 (FZ 2)	Y	Moderate	High		
West				·**Foul sewer** (150-225mm) connects to a combined (450mm) sewer and drains north east through Cowpen and then north to Blyth Ww TW. ·**SW sewer** (450-900mm) discharges into an unnamed tributary of the River Blyth.		-	-		FZ 1	Y	Low	High		
Wellesley Home Site				· **Combined sewer** ·**SW sewer** (325-450mm) discharges into the North Sea.		-	-	SHLAA 4755 - The site is also near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	FZ 1	Y	Low	High		
Bebside and Employment Area (5ha)				· **Combined sewer** (225-300mm) drains north east to Blyth Ww TW.		5	-		FZ 1	Y	Medium	High		
Bates Colliery Site				· **Combined sewer** (225-300mm) drains west and north to Blyth Ww TW. ·**SW sewer** (600-900mm) discharges north to the River Blyth.	Sewer flooding has been reported to the southwest of the potential development area option, therefore there may be a risk of sewer flooding and/or potential capacity constraints at this location.	SHLAA 4573 - 5	-	SHLAA 4573 - The site is also near to a SPS, therefore in accordance with Sewers for Adoption 6th Edition, habitable buildings should be no closer than 15 metres to the SPS.	SHLAA 4573 (FZ 2 & 3b)	Y	Moderate	Low		Infiltration SuDS may not be possible due to geology
Employment Areas C02 and C03				The C03 site is to the west of an unnamed tributary of the River Blyth and will need to cross the river to reach the Ww TW. This may cause a potential constriction to any new development in the settlement area.		-	-	-	FZ 2 & 3	Y	High	High		
The Blyth Estuary Strategic Employment Area				· **Combined sewer** (375-600mm diameter) Sites to the South of the River Blyth will be served by the Blyth Ww TW. Sites to the North of the River Blyth would be served by Cambois Ww TW.		-	-	-	FZ 2 & 3	Y	High	Moderate		
Commissioner's Quay									FZ 2 & 3	Y	High	High		
Employment Area West (5ha)				There is currently no sewer network at this site. New infrastructure would be required to connect any development to an existing sewer network.	N/A	N/A	N/A	N/A	FZ 1	Y	Moderate	High		

TABLE 5-34: BLYTH SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Employment Area F18				· **Combined sewer** This site may require local connections to the existing combined sewer network and treated at Cambois WwTW.		-	-	-	FZ 1	Y	Moderate	High		

5.5.5 ***Cramlington***

Overview of proposed development

There are two scenarios for development in Cramlington; Scenario 1 has a dwellings target of 3480 houses and Scenario 2 has a target of 3820 houses.

The preferred potential development area options are to the South West of Cramlington, which can accommodate 4000 houses and to the north of the town centre, which can supply 300 houses, and would require the additional/alternative potential development area options and / or other key sites to make up the rest of the dwellings targets (Table 5-35). Cramlington has the potential to develop 102.602 ha of employment land.

Foul flows from development within some of Cramlington will drain to Cramlington WwTW which is situated to the immediate north of East Hartford. Cramlington WwTW discharges treated effluent into the River Blyth estuary in dry conditions and into the River Blyth during storm conditions allowing storm flows to go to the estuary. Foul flows from development within the south western part of Cramlington could drain to Howdon WwTW in North Tyneside, which discharges into the tidal River Tyne or to Cramlington WwTW.

TABLE 5-35: POTENTIAL DEVELOPMENT AREA OPTIONS IN CRAMLINGTON

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Cramlington	Scenario 1 3480 Scenario 2 3820	South West	Preferred	4000	1000	1000	1000	1000	102.602
		Town Centre	Preferred	300	75	75	75	75	
		South East	Additional/ Alternative	2470	617	617	618	618	
		East Hartford	Additional/ Alternative	1660	415	415	415	415	
		Officers Club Site	Other Key Sites	120	30	30	30	30	

WCS Assessment Summary

Table 5-36 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-25 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Through consultation, the Environment Agency has advised that the Coal Authority is actively managing the mine water levels at Bates, Blyth. The dewatering pumps are at capacity and mine water level is close to ground level in Blyth area, and gradients radiate out as far as Algernon, Cobalt Business Park North Tyneside. These gradients have been intercepted by the Seaton Burn with mine water discharging into the stream bed in the lower reach at Seaton Sluice. The Coal Authority are investigating this and have proposed drilling a new monitoring borehole at East Holywell.

Infrastructure Recommendations

- Howdon WwTW currently has limited headroom available and NW could direct most of the additional flows from Cramlington South West sector to Cramlington WwTW.
- The sewer network in the South West potential development area option has a historic record of sewer flooding. Further investigation and possible infrastructure

upgrades may be required in these areas before development can commence in this area.

- SHLAA site 6776 in the South East potential development area option has a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
  - Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- SHLAA 8692 in East Hartford is close to Cramlington WwTW and NW would require odour assessment as part of the planning application and their response to the application would depend on the odour assessment outcome. Therefore alternative potential development area options should be considered for this settlement area.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-36: CRAMLINGTON SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
South West	Kielder WRZ	Cramlington Ww TW	River Blyth GB103022077050	· **Foul** sewer (150-375mm) at Beaconhill connects to a combined sewer to the north of Nelson Village and continues north through the industrial estates to join the 1050mm combined sewer to the north of Cramlington. This sewer drains northeast to Cramlington Ww TW.	Sewer flooding has been reported to the east of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	3	-		FZ 1	Y	High	High		
		Howdon Ww TW	River Tyne (tidal)	· **Foul** sewer drains eastwards through Southfield Lea and crosses the A189. The combined sewer drains southeast to connect to a 950mm combined sewer, which continues east to the north of Seaton Burn and then to the south of Holywell. From a pumping station it follows the Seaton Burn northwards to Seaton, then drains south along the Collywell Bay Road to the A193. From here it continues south to eventually connect to Howdon Ww TW										
Town Centre		Cramlington Ww TW	River Blyth GB103022077050	· **Foul sewer** (375mm) connects to the 975mm combined sewer and drains northwards to the Cramlington Ww TW. ·**SW sewer** (975mm) discharges into the Horton Burn.		1	1		FZ 1	Y	High	Very High		
South East		Howdon Ww TW	River Tyne (tidal)	· **Combined sewer** (375mm) drains southeast to connect to a 950mm combined sewer, which continues east to the north of Seaton Burn and then to the south of Holywell. From a pumping station it follows the Seaton Burn northwards to Seaton, then drains south along the Collywell Bay Road to the A193. From here it continues south to eventually connect to Howdon Ww TW.		SHLAA 6776 - 5	-		FZ 1	Y	High	High		
East Hartford		Cramlington Ww TW	River Blyth GB103022077050	· **Combined sewer** (1275mm)		2	-	SHLAA 6892 - A Public Sewer crosses the site and NW would require it to be diverted or placed within a suitable easement. The site near to a Ww TW which by the nature of their function can produce odours which lead to customer complaints. Any development upon this site which NCC chooses to permit through the planning process should be supported by a full odour assessment. NW's response to the planning application would be dependent upon the outcome of the odour assessment.	FZ 1	Y	High	High		
Officers Club Site		Cramlington Ww TW	River Blyth GB103022077050	·**Foul sewer** (300mm) drains northwest and then north east, to connect to a combined sewer to the north of Nelson Village. The sewer continues north through the industrial estates to join the 1050mm combined sewer to the north of Cramlington. This sewer drains northeast to the Cramlington Ww TW.		-	-		FZ 1	Y	High	High		

TABLE 5-36: CRAMLINGTON SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Employment Area C07, C11, C17-C22		Howdon WwTW	River Tyne (tidal)	· **Foul sewer** connects to the 1050mm combined sewer to the north of Cramlington, which drains to Howdon WwTW.		-	-		FZ 1	Y	High	High		
Employment Area C10				· **Foul sewer** (150mm) drains south and joins a combined 375mm sewer, which continues south and eventually connects to Howdon WwTW. ·**SW sewer** (525-600mm) discharges into Sandy's Letch.		-	-		FZ 1	Y	High	High		
Employment Area C24		Cramlington WwTW	River Blyth GB103022077050	· **Foul sewer** connects to the combined 1275mm sewer, which drains to the Cramlington WwTW.		-	-		FZ 1	Y	High	High		

5.5.6 *Guidepost, Stakeford and Choppington*

Overview of proposed development

There are two scenarios for development in the Guidepost, Stakeford and Choppington area; Scenario 1 has a dwellings target of 420 houses and Scenario 2 has a target of 380 houses.

The preferred potential development area options are to the South East of the settlement area, which can accommodate 250 housing units and South West of the settlement area, which can accommodate 180 housing units (Table 5-37). This settlement area has the potential to develop 0.212 ha of employment land.

Foul flows from development within Guidepost/Stakeford will drain to Cambois WwTW which is situated to the north of Cambois and south of North Seaton Colliery, immediately east of the A189 and north of a mineral railway. Cambois WwTW discharges treated effluent into the North Sea via a long sea outfall.

TABLE 5-37: POTENTIAL DEVELOPMENT AREA OPTIONS IN GUIDEPOST, STAKEFORD AND CHOPPINGTON

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Guidepost Stakeford Choppington	Scenario 1 420 Scenario 2 380	South East Guidepost	Preferred	250	62	62	63	63	0.212
		South West Guidepost	Preferred	180	45	45	45	45	
		Choppington / Scotland Gate	Alternative	310	77	77	78	78	

WCS Assessment Summary

Table 5-38 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-24 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- In the Choppington/Scotland Gate potential development area option, SHLAA 5015 is located within Flood Zone 2 and Flood Zone 3a. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-38: GUIDEPOST, STAKEFORD AND CHOPPINGTON SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
South East Guidepost	Kielder WRZ	Cambois Ww TW	The North Sea	· **Foul sewer** (150mm) connects to a combined (375mm) sewer on A196 High Street, which drains eastwards. At the A1147 Half Moon Street, the sewer has a 675mm diameter and southeast, through West Sleekburn and onto Cambois Ww TW. · **SW sewer** (300mm)		-	2		FZ 1	Y	High	Very High		
South West Guidepost				· **Foul sewer** (100mm) connects to a (225mm) combined sewer, which drains south through Choppington to Willow Bridge Cottage and joins a combined sewer that flows eastwards to Red Row Bedlington Pumping Station (875mm). It continues east to a pumping house and then northeast to Cambois Ww TW. · **SW sewer** (525mm) discharges into the Willow Burn		-	1		FZ 1	Y	High	Very High		
Choppington / Scotland Gate				· **Combined sewer** (600mm) joins another combined sewer that flows eastwards to Red Row Bedlington Pumping Station (875mm). It continues east to a pumping house and then northeast to Cambois Ww TW.		3	-		SHLAA 5015 – FZ 2 & 3a	Y	High	High		
Employment Land F04				*Western Side:* ·**Foul sewer** (225mm) crosses the Sleek Burn via a 300mm pipe to join the 525mm combined sewer, which flows eastwards to Red Row Bedlington Pumping Station ·**SW sewer** (450mm) discharges to the Sleek Burn *Eastern Side:* ·**Foul sewer** drains eastwards and connects to a (525mm) combined sewer, which drains north to join a 825mm combined sewer to Red Row Bedlington pumping Station. However, the 525mm sewer reduces to 375mm before it crosses the Sleek Burn, which may limit capacity. ·**SW sewer** discharges to the Sleek Burn		-	-	-	FZ 1	Y	High	High		

5.5.8 ***Newbiggin-by-the-Sea***

Overview of proposed development

There are two scenarios for development in Newbiggin-by-the-sea; Scenario 1 has a dwellings target of 320 houses and Scenario 2 has a target of 300 houses.

The preferred potential development are options are to the North West of the settlement area, which can accommodate 300 housing units and South West of the settlement area, which can accommodate 100 housing units (Table 5-39). There are no planned employment opportunities in this settlement area.

Foul flows from development within Newbiggin-by-the-Sea will drain to Newbiggin WwTW which is situated to the south of Newbiggin-by-the-Sea and the east of North Seaton. Newbiggin WwTW discharges treated effluent into the North Sea via a long sea outfall.

TABLE 5-39: POTENTIAL DEVELOPMENT AREA OPTIONS IN NEWBIGGIN-BY-THE-SEA

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
New biggin-by-the-Sea	Scenario 1 320 Scenario 2 300	North West	Preferred	300	75	75	75	75	N/A
		South West	Preferred	100	25	25	25	25	
		North	Additional/ Alternative	210	52	52	53	53	
		Central	Additional/ Alternative						

WCS Assessment Summary

Table 5-40 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-23 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option As well as the location of the WwTW and any historic sewer flooding.

Through consultation, the Environment Agency have advised that minewater levels are rising from cessation of deep mine dewatering and active mine water control is proposed for Ellington / Lynemouth to prevent polluting mine water discharges into the River Wansbeck.

Infrastructure Recommendations

- Newbiggin WwTW currently has surface water entering the network resulting in limited headroom for additional foul flows, therefore the source of infiltration will need to be investigated. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- The North West potential development area option has a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The South West potential development area option is within close proximity of Newbiggin WwTW and NW would object to the development of the site. Therefore

alternative potential development area options should be progressed for this settlement area.

- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-40: NEWBIGGIN-BY-THE-SEA SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
North West	Kielder WRZ	New biggin Ww TW	The North Sea	*Southern Site:* · **Combined sewer** (150-225mm) drains north east along Oakwood Avenue, then changes direction to southeast, through the North potential development area option site. The sewer joins the 1200mm combined sewer on High street and continues southeast, along the B1334 to North Seaton Road, where it heads south (1900mm pipe) to New biggin Ww TW. *Northern Site:* · **Foul sewer** drains south and connects to the combined sewer, which joins the combined sewer along Oakwood Avenue. · **SW sewer** (150mm) discharges into the Woodhorn Burn.		5	-		FZ 1	Y	High	High		
South West				· **Foul sewer** (150mm) connects to a combined sewer (300-375mm) which drains south and the west to the Ww TW. · **SW sewer** (225-400mm)		3	-	The site is near to a Ww TW and NW would object to the development of the site.	FZ 1	Y	High	High		
North				· **Combined sewer** (300mm) downstream of Oakwood Avenue joins the 1200mm diameter combined sewer on High street and continues southeast, along the B1334 to North Seaton Road, where it heads south (1900mm pipe) to New biggin Ww TW. · **SW sewer** (600mm) discharges into the North Sea		2	2		FZ 1	Y	High	High		
Central				· **Combined sewer** (150-225mm)		-	-		FZ 1	Y	High	High		

5.5.10 ***Seaton Valley***

Overview of proposed development

There are two scenarios for development in the Seaton Valley; Scenario 1 has a dwellings target of 800 houses and Scenario 2 has a target of 780 houses.

The preferred potential development area options are in Wheatridge Park, Wheatfields and North East New Hartley. Alternative potential development area options are located to the North West, North of A190, north of Wheatfields and North East of Holywell (Table 5-41). Seaton Valley has the potential to develop 1.419 ha of employment land.

Foul flows from development within the Seaton Valley Villages is likely to drain towards Howdon WwTW which is situated on the north bank of the River Tyne in North Tyneside. Howdon WwTW discharges treated effluent into the tidal River Tyne.

TABLE 5-41: POTENTIAL DEVELOPMENT AREA OPTIONS IN SEATON VALLEY

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Seaton Valley	Scenario 1 800 Scenario 2 780	Wheatridge Park	Preferred	285	71	71	71	72	1.419
		Wheatfields	Preferred	190	47	47	48	48	
		North East New Hartley	Preferred	213	53	53	53	54	
		North West Seaton Delaval	Additional/ Alternative	160	40	40	40	40	
		North of A190	Additional/ Alternative	200	50	50	50	50	
		North of Wheatfields	Additional/ Alternative	430	107	107	108	108	
		North East Holywell	Additional/ Alternative	900	225	225	225	225	

WCS Assessment Summary

Table 5-42 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-25 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Through consultation, the Environment Agency has advised that the Coal Authority is actively managing the mine water levels at Bates, Blyth. The dewatering pumps are at capacity and mine water level is close to ground level in Blyth area, and gradients radiate out as far as Algernon, Cobalt Business Park North Tyneside. These gradients have been intercepted by the Seaton Burn with mine water discharging into the stream bed in the lower reach at Seaton Sluice. The Coal Authority are investigating this and have proposed drilling a new monitoring borehole at East Holywell.

Infrastructure Recommendations

- Howdon WwTW currently has limited headroom available. Surface water removal schemes may need to be identified.
- The sewer network in the North of A190 and Employment Area C13 potential development area options have a historic record of sewer flooding. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.

- Wheatfields, North East New Hartley, North West Seaton Delaval, North of A190 and North of Wheatfields potential development area options have a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. North East Holywell has a 2020 sewer capacity of 4.
  - If the development is on previously developed land, this may provide opportunities to reduce the flood risk by promoting a policy of surface water separation. For sites where there are no suitable watercourses to discharge surface water into, the redevelopment should aim for a significant reduction in the surface water runoff rate from the site, using SuDS where possible.
  - Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The Wheatfields and North of Wheatfields potential development area options have a 2020 surface water capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- All development sites, except North of A190, are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-42: SEATON VALLEY SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Wheatridge Park	Kielder WRZ	Howdon WwTW	River Tyne (tidal)	·**Foul sewer** (150mm) drains north east, where the foul sewer connects to a combined sewer (525-600mm). The combined sewer continues north to Lysdon Farm, then east and south east to Seaton. The sewer drains south along the Collywell Bay Road to the A193 and continues south to eventually connect to Howdon WwTW. ·**SW sewer** (300-1200mm) discharges into the Lysdon Burn		-	-		FZ 1	Y	Moderate	High		
Wheatfields				·**Foul sewer** (150mm) connects to a combined sewer, which drains north east, to the north of New Hartley, following a tributary of the Lysdon Burn to Lysdon Farm. It then continues east and south east to Seaton. The sewer then drains south along the Collywell Bay Road to the A193. From here it continues south to eventually connect to Howdon WwTW. ·**SW sewer** (375mm)		5	5		FZ 1	Y	High	High		
North East New Hartley				·**Combined sewer** (225mm) drains northwest through New Hartley to a 375mm combined sewer, which follows a tributary of the Lysdon Burn northwards to Lysdon Farm. It then continues east and south east to Seaton. The sewer then drains south along the Collywell Bay Road to the A193.		5	-		FZ 1	Y	Moderate	High		
North West Seaton Delaval				·**Combined sewer** (225-300mm) drains northeast through New Hartley to the 375mm diameter sewer, which goes to Lysdon Farm.		5	-		FZ 1	Y	High	High		
North of A190				·**Combined sewer** (150-375mm) drains northeast, around the eastern side of the New Hartley development site to Lysdon Farm. It then continues east and south east of Seaton. The sewer then drains south along the Collywell Bay Road to the A193.	Sewer flooding has been reported to the southwest of the potential development area option, therefore there may be a risk of sewer flooding and/or potential capacity constraints at this location.	5	-		FZ 1		Moderate	High		
North of Wheatfields				·**Combined sewer** (150-375mm) drains to the north of New Hartley, following a tributary of the Lysdon Burn to Lysdon Farm. It then continues east and south east to Seaton. The sewer then drains south along the Collywell Bay Road to the A193. From here it continues south to eventually connect to Howdon WwTW.		5	5		FZ 1	Y	High	High		
North East Holywell				·**Combined sewer** on Holywell Avenue near Holywell Village First School) or near Seaton Terrace. The sewers join a combine sewer that drains eastwards along the south of the settlement area. To a pumping station. It follows the Seaton Burn northwards (675mm) to Seaton, then drains south along the Collywell Bay Road to the A193.		4	-		FZ 1	Y	High	High		

TABLE 5-42: SEATON VALLEY SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Employment Area C13				·**Combined sewer** (150-375mm)	Sewer flooding has been reported to the northeast of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	-	-	-	FZ 1	Y	Moderate	High		
Employment Area C12				·**Combined sewer** (375mm) drains northeast through New Hartley to the 375mm diameter sewer, which goes to Lysdon Farm.		-	-	-	FZ 1	Y	Moderate	High		

5.5.11 ***Rest of Delivery Area***

Overview of proposed development

There are two scenarios for development in the rest of the South East Delivery Area; Scenario 1 has a dwellings target of 780 houses and Scenario 2 has a target of 720 houses.

Potential development sites include Lynemouth, Ellington, Widdrington Station and Stobswood, and Hadston (Table 5-43).

Hadston has the potential to develop 1.22 ha of employment land.

Foul flows from development within Lynemouth, Ellington, Widdrington Station and Stobswood, and Hadston will drain to the Lynemouth WwTW which discharges treated effluent to the Lyn Estuary.

TABLE 5-43: POTENTIAL DEVELOPMENT AREA OPTIONS IN REST OF SOUTH EAST DELIVERY AREA

Settlement Areas	Dwellings Target	Potential development area options	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
				2011-2016	2016-2021	2021-2026	2026-2031	
Rest of South East Delivery Area	Scenario 1 780 Scenario 2 720	Lynemouth	200	50	50	50	50	N/A
		Ellington	470	117	117	118	118	
		Widdrington Station / Stobswood	400	100	100	100	100	
		Hadston	430	107	107	108	108	1.22

WCS Assessment Summary

Table 5-44 provides a summary of the WCS site assessment for each of the potential development area options. Figures 5-26 and 5-27 show the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Through consultation, the Environment Agency have advised that minewater levels are rising from cessation of deep mine dewatering and active mine water control is proposed for Ellington / Lynemouth to prevent polluting mine water discharges into the River Wansbeck.

Infrastructure Recommendations

- Lynemouth WwTW currently has surface water entering the network resulting in no headroom for additional foul flows, the source of infiltration has been identified and a scheme identified to remove it. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment
- The sewer network in the Hadston and Employment Area D01 potential development area options have a historic record of sewer flooding. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The Lynemouth potential development area option has a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Ellington has a 2020 sewer capacity of 4. Further

investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.

- Lynemouth potential development area option is within close proximity of Lynemouth WwTW and NW would object to the development of the site. Therefore alternative potential development area options should be progressed for this settlement area.
- The Lynemouth potential development area option in located within Flood Zone 2 and 3b. The Ellington potential development area option is located within Flood Zone 2 and 3a. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- The Widdrington Station / Stobswood and Hadston and Employment area D01 potential development area options are located on superficial deposits with a low permeability, and therefore infiltration SuDS are unlikely to be suitable are this location. Local site investigations would be required to assess SuDS options prior to development.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

TABLE 5-44: REST OF SOUTH EAST SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Lynemouth	Kielder WRZ	Lynemouth Ww TW	Lyn Estuary	· **Combined sewer** (225mm) drains north to Lynemouth Ww TW.		5	-	Both a Water Main and Public Sewer crosses the site and NW would require it to be diverted or placed within a suitable easement. The site is also near to a Ww TW and NW would object to the development of the site.	FZ 2 & 3b	Y	High	High		
Ellington				The Ellington sewer drains south east to Deanhouse Pumping Station, then southeast to Lynemouth Ww TW.		4	-		FZ 2 & 3a	Y	High	High		
Widdrington Station / Stobswood				*North Stobswood* · **Combined sewer** drains north west near Widdrington Moor, and then east towards Widdrington. The sewer then drains north, along Chevington Burn to Red Row pumping station (south of Hadston), north to Ladyburn Woods pumping station, and then south, through Widdrington along the A1068, then through Ellington and Lynemouth before reaching Lynemouth Ww TW. *Southern Site* · **Foul sewer** connects to a 300mm diameter combined sewer on Old Ferney Beds Road, which joins a 450mm combined sewer along Mile Road draining southeast. The combined sewer continues southeast to Ellington Bridge and connects to the 300mm combined sewer to Deanhouse Pumping Station. · **SW sewer** (300mm) Linton Burn		-	-		FZ 1	Y	High	Low		Infiltration SuDS may not be possible due to geology
Hadston and Employment area D01				*North Hadston* · **Foul sewer** connects to a 300mm diameter combined sewer, which drain east to join the 315mm combined sewer, which heads north to Ladyburn wood pumping station, and then south along the A1068. *Southern site* · **Combined sewer** drains north east to connect to the 300mm combined sewer in Hadston and continues to the A1068.	Sewer flooding has been reported to the south of Hadston, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	-	-		FZ 1	Y	Medium	Low		Infiltration SuDS may not be possible due to geology

5.6 West Northumberland Delivery Area

5.6.1 *Haltwhistle*

Overview of proposed development

Haltwhistle has a development target of 400 dwellings over the planning period. The preferred potential development area option is to the West of the settlement area, which can supply 340 housing units and the Northern development site could provide the additional houses needed to meet the dwellings target (Table 5-45). Haltwhistle has the potential to develop 1.449 ha of employment land.

Foul flows from development within Haltwhistle will drain to Haltwhistle WwTW which is situated to the south east of Haltwhistle, between the railway and the River South Tyne. Haltwhistle WwTW discharges treated effluent into Haltwhistle Burn, which flows into the River South Tyne.

TABLE 5-45: POTENTIAL DEVELOPMENT AREA OPTIONS IN HALTWHISTLE

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Haltwhistle	400	West	Preferred	340	85	85	85	85	1.449
		North	Additional/ Alternative	220	55	55	55	55	

WCS Assessment Summary

Table 5-46 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-28 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Haltwhistle WwTW currently has limited headroom available and NW are currently monitoring the flows at the works to assess the impact of a surface water removal project. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment
- The sewer network in the West potential development area option has a historic record of sewer flooding. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- Employment Area E03 is located within Flood Zone 2 and 3. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- The West and Employment Area E03 development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.
- Drainage systems laid within the river gravels have the potential to have reduced capacity due to ingress of groundwater and/or river water. An assessment of the groundwater-surface water interaction/connectivity will be needed in these cases.

TABLE 5-46: HALTWHISTLE SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
West	Kielder WRZ	Haltwhistle WwTW	Haltwhistle Burn GB103023075570	· **Combined sewer** (150mm)	Sewer flooding has been reported to the east of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	-	-		FZ 1	Y	High	Very High		
North				·**Foul sewer** (100-150mm) connects to a combined sewer system. ·**SW sewer** (150mm) discharges either directly to the Haltwhistle Burn, or into a culvert to the southeast of Haltwhistle, which drains further downstream into the Haltwhistle Burn.		-	-		FZ 1		High	High		
Employment Area E03				·**Combined sewer** (300-675mm) This employment site is close to Haltwhistle WwTW.		-	-	-	FZ 2 & 3	Y	High	High		

5.6.3 *Haydon Bridge*

Overview of proposed development

Haydon Bridge has a development target of 200 dwellings over the plan period. The preferred potential development area option is to the West of the settlement area, which can accommodate 80 housing units. The additional/alternative potential development area options in the South West and South East of the settlement area would be required to make up the total dwellings target (Table 5-47). There are no planned employment opportunities in this Haydon Bridge.

Foul flows from development within Haydon Bridge will drain to Haydon Bridge WwTW which is situated to the east of Haydon Bridge, immediately north of the A69. Haydon Bridge WwTW discharges treated effluent into the River South Tyne.

TABLE 5-47: POTENTIAL DEVELOPMENT AREA OPTIONS IN HAYDON BRIDGE

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Haydon Bridge	200	West	Preferred	80	20	20	20	20	N/A
		South West	Additional/ Alternative	75	19	19	19	18	
		South East	Additional/ Alternative	80	20	20	20	20	

WCS Assessment Summary

Table 5-48 provides a summary of the WCS site assessment for each of the potential development area options. Figure 5-29 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Haydon Bridge WwTW currently has surface water entering the network resulting in no headroom for additional foul flows, therefore the source of infiltration will need to be investigated and the works may require an upgrade to accommodate the new development. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- SHLAA site 2444 in the South East potential development area option is within close proximity of Haydon Bridge WwTW and NW would object to the development of the site. Therefore alternative potential development area options should be progressed for this settlement area.
- The West potential development area option is located in Flood Zone 2 and the South East potential development area option is located within Flood Zone 2 and 3a. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- The South West and South East potential development area options are at risk of surface water flooding, therefore surface water management measures and

appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.

- Drainage systems laid within the river gravels have the potential to have reduced capacity due to ingress of groundwater and/or river water. An assessment of the groundwater-surface water interaction/connectivity will be needed in these cases.

TABLE 5-48: HAYDON BRIDGE SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
West	Kielder WRZ	Haydon Bridge Ww TW	River South Tyne GB103023075710	· **Foul sewer** (100-150mm) connects to a combined sewer system. The site is north of the River South Tyne, and would require passing under the river to the Ww TW via the 150mm inverted siphon, which may limit capacity. · **SW sewer** (150mm) River South Tyne.		5	-		FZ 2		High	Very High		
South West				· **Foul sewer** (150mm) connects to a combined sewer system. · **SW sewer** (300mm) River South Tyne.		5	-			Y	High	Very High		
South East				· **Foul sewer** (150mm) connects to a combined sewer system. · **SW sewer** (300mm) River South Tyne.		3	-	SHLAA 2444 - Both a Water Main and Public Sewer crosses the site and NW would require it to be diverted or placed within a suitable easement. The site is also near to a Ww TW and NW would object to the development of the site.	FZ 2 & 3a	Y	High	High		

5.6.5 ***Bellingham***

Overview of proposed development

There are two scenarios for development in Bellingham; Scenario 1 has a dwellings target of 300 houses and Scenario 2 has a target of 280 houses. The preferred potential development area options are the Auction Mart Site and to the West of Bellingham. The additional/alternative potential development area options and/or other key sites would be required to make up the total dwellings targets (Table 5-49). Bellingham has the potential to develop 0.223 ha of employment land.

Foul flows from development within Bellingham will drain to Bellingham WwTW which is situated to the south of Bellingham, immediately south of Boat Road. Bellingham WwTW discharges treated effluent into the River North Tyne.

Foul flows from development within Wark will drain to Wark WwTW and the treated effluent discharges into the River North Tyne. Foul flows from development within Birtley will drain to Birtley WwTW, which discharges treated effluent into and unnamed tributary of the River North Tyne.

TABLE 5-49: POTENTIAL DEVELOPMENT AREA OPTIONS IN BELLINGHAM

Settlement Areas	Dwellings Target	Potential development area options	Option Type	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
					2011-2016	2016-2021	2021-2026	2026-2031	
Bellingham	Scenario 1 300 Scenario 2 280	Auction Mart Site	Preferred	100	25	25	25	25	0.223
		West	Preferred	100	25	25	25	25	
		South	Additional/ Alternative	65	16	16	16	17	
		Wark	Other Key sites	150	37	37	38	38	
		Birtley	Other Key sites	28	7	7	7	7	

WCS Assessment Summary

Table 5-50 provides a summary of the WCS site assessment for each of the potential development area options. Figures 5-30 and 5-31 show the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Wark WwTW currently has no headroom available, therefore the works may require an upgrade to accommodate the new development. Birtley WwTW was not assessed by NW, however when growth is certain in this potential development area option, NW will commence their investment procedure. If a new hydraulic consent is required at these works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.

- The Auction Mart Site, West and South potential development area options have a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. SHLAA site 2351 in the West potential development area option also has a 2020 surface water capacity factor of 5. Further investigation and possible infrastructure upgrades may be required before development can commence in this area.
- The South potential development area option is near to Bellingham WwTW and NW would object to the development of the site. Therefore alternative potential development area options should be progressed for this settlement area.
- The South Bellingham, Wark and Birtley potential development area options are located in Flood Zone 2 and Flood Zone 3a. Employment Area E02 is located within Flood Zone 2. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All the potential development area options, except West Bellingham, are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.
- Drainage systems laid within the river gravels have the potential to have reduced capacity due to ingress of groundwater and/or river water. An assessment of the groundwater-surface water interaction/connectivity will be needed in these cases.

TABLE 5-50: BELLINGHAM SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Auction Mart Site	Kielder WRZ	Bellingham Ww TW	River North Tyne GB103023074960	· **Foul sewer** (150mm) connects to a combined sewer system. ·**SW sewer discharges into the** Hareshaw Burn		5	1		FZ 1	Y	Very High	High		
West				· **Foul sewer** (150mm) connects to a combined sewer system (225mm). ·**SW sewer discharges into the** Hareshaw Burn or an unnamed watercourse in Jubilee Park		5	SHLAA 2351 - 5		FZ 1		High	High		
South				· **Combined sewer** (225mm)	Sewer flooding has been reported to the east of the potential development area option, therefore there may be a risk of sewer flooding and /or potential capacity constraints at this location.	5	-	A Public Sewer crosses the site and NW would require it to be diverted or placed within a suitable easement. The site is also near to a Ww TW and NW would object to the development of the site. Note that there are existing houses closer to Ww TW than proposed site.	FZ 2 & 3a	Y	High	High		
Employment Area E02				· **Combined** (150-225mm)		-	-	-	FZ 2	Y	High	High		
Wark		Wark Ww TW	River North Tyne GB103023074920	· **Combined sewer** (150-300mm) The foul sewer at West Acres connects to a combined sewer system ·**SW sewer** discharges into the Dean Burn		-	-	-	FZ 2 & 3a	Y	High	High		
Birtley		Birtly Ww TW	Unnamed Tributary of the River North Tyne	· **Foul** (152mm) The foul sewer connects to a combined sewer before reaching Birtley Ww TW. ·**SW sewer** (152mm)		-	-	-	FZ 2 & 3a	Y	High	High		

5.7.1 ***Allendale***

Overview of proposed development

Allendale has a development target of 100 dwellings, and although no preferred strategic development area is suggested, most of the development is likely to occur in Allendale, with some development in Catton and Allenheads. The proposed housing units are not available for this settlement area, therefore it is assumed that the dwellings target is equally between the four planning phases (Table 5-51).

Allendale has the potential to develop 1.133 ha of employment land.

Foul flows from development within Allendale will drain gravitationally via combined sewers to Allendale WwTW which is situated to the north west of Allendale, to the south of Catton. Allendale WwTW discharges treated effluent into the River East Allen.

TABLE 5-51: POTENTIAL DEVELOPMENT AREA OPTIONS IN ALLENDALE

Settlement Areas	Dwellings Target	Potential development area options	Total Proposed Housing Units	Housing Development Phasing				Employment (Jobs)
				2011-2016	2016-2021	2021-2026	2026-2031	
Allendale	100	Allendale	100	25	25	25	25	1.133
		Catton						

WCS Assessment Summary

Table 5-52 provides a summary of the WCS site assessment for the potential development area option. Figure 5-32 shows the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and the location of any historic sewer flooding.

Infrastructure Recommendations

- Allendale WwTW currently has issues with ingress; surface water is entering the network resulting in no capacity for additional foul flows, therefore the works may require an upgrade to accommodate the new development. If a new hydraulic consent is required at this works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- The Catton and Employment Areas E01 and E21 potential development area options are located in Flood Zone 2 and Flood Zone 3. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All the potential development area options are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.
- Drainage systems laid within the river gravels have the potential to have reduced capacity due to ingress of groundwater and/or river water. An assessment of the groundwater-surface water interaction/connectivity will be needed in these cases.

TABLE 5-52: ALLENDALE SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Allendale	Kielder WRZ	Allendale Ww TW	River East Allen GB103023074710	*North and East:* There are two main sewers draining from existing developments approximately parallel to the River East Allen and along the B6303, so development to the north of Allendale and east of the river would be preferable. There is a single (150mm) drain along the B6303 and a dual drain parallel to the river. *South:* Sewerage from any new development may be constrained according to the capacity of the existing network in the town. *West:* The sewer crosses the River East Allen before connecting to the Ww TW, therefore capacity upgrades may be difficult.		-	-	-	FZ 1	Y	High	High		
Catton and Employment Areas E01 and E21				· **Combined sewer** (150mm)		-	-	-	FZ 2 & 3	Y	High	High		

5.7.3 ***Rest of Delivery Area***

Overview of proposed development

There are two scenarios for development in the rest of West Delivery Area; Scenario 1 has a dwellings target of 480 houses and Scenario 2 has a target of 420 houses. The development target could be accommodated by a combination of the 16 settlement areas listed in Table 5-53.

There are no planned employment opportunities in the rest of the West Delivery Area.

Bardon Mill, Redburn and Henshaw drain via combined sewers to Bardon Mill WwTW, which is located to the south of Ashcroft in Bardon Mill, on the north bank of the River South Tyne.

TABLE 5-53: POTENTIAL DEVELOPMENT AREA OPTIONS IN REST OF WEST DELIVERY AREA

Settlement Areas	Dwellings Target	Potential development area options	Total Proposed Housing Units	Housing Development Phasing				Employment Land (ha)
				2011-2016	2016-2021	2021-2026	2026-2031	
Rest of West Delivery Area	Scenario 1 480 Scenario 2 420	Fourstones / Newbrough	260	65	65	65	65	N/A
		Humshaugh	170	42	42	43	43	
		Barrasford	70	17	17	18	18	
		Gunnerton	60	15	15	15	15	
		Great Whittington	90	22	22	23	23	
		Bardon Mill / Redburn / Henshaw	50	12	12	13	13	

WCS Assessment Summary

Table 5-54 provides a summary of the WCS site assessment for each the potential development area option. Figures 5-33, 5-34 and 5-35 show the risk of fluvial/tidal flooding and surface water flooding to each potential development area option as well as the location of the WwTW and any historic sewer flooding.

Infrastructure Recommendations

- Humshaugh WwTW currently has no headroom available, therefore the works may require an upgrade to accommodate foul flows from the new development. Great Whittington WwTW was not assessed by NW, however when growth is certain in this potential development area option, NW will commence their investment procedure. If a new hydraulic consent is required at these works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. The WCS assessment has determined that it is likely to be possible to tighten these consents within the limits of conventional treatment.
- NW have confirmed that surface water flows from a culvert are currently draining to Fourstones WwTW and once this culvert has been redirected there will be headroom available for foul flows from the new development.
- The Fourstones/Newbrough potential development area option has a 2020 sewer capacity factor of 5, which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.
- The SHLAA sites 2537, 2075, 2475, 2474, 2473, 2472 and 2575 within the Fourstones/Newbrough potential development area option are within close

proximity of Fourstones WwTW and SHLAA site 2597 in Humshaugh is within close proximity of Humshaugh WwTW. NW would object to the development of these sites, therefore alternative potential development area options should be progressed for this settlement area.

- SHLAA 6881 in Great Whittington is close to Great Whittington WwTW, therefore NW would require odour assessment as part of the planning application and their response to the application would depend on the odour assessment outcome. Alternative potential development area options should be considered for this settlement area.
- SHLAA 2537 and 2474 in Fourstones and 2390 and 2528 in Gunnerton are located within Flood Zone 2 and Flood Zone 3a. SHLAA site 2638 in Barrasford is located within Flood Zone 2. Development within these sites should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, mitigation of flooding both to and from the site is likely to be required with the potential need for greater investment in flood defence infrastructure.
- All development sites are at risk of surface water flooding, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used in this settlement area.
- Drainage systems laid within the river gravels have the potential to have reduced capacity due to ingress of groundwater and/or river water. An assessment of the groundwater-surface water interaction/connectivity will be needed in these cases.

TABLE 5-54: REST OF WEST DELIVERY AREA SITE ASSESSMENT

Potential development area option	Water Resources	Overall WwTW Assessment	Receiving Watercourse	Sewer Type (diameter)	Sewer Flooding	NW Assessment			Fluvial/Tidal Flood Risk	SW Flood Risk	Bedrock Permeability	Superficial Permeability	SPZ	SuDS Constraints
						Foul Sewer Capacity Factor	SW Capacity Factor	Diversion/ Easement						
Fourstones / New brough	Kielder WRZ	Fourstones Ww TW	River South Tyne GB103023075710	· **Combined sewer** (150mm)		SHLAA 2609, 2537,2075,2475 2474, 2472 and 6857 - 5	1, 3	SHLAA 2537, 2075,2475, 2474, 2473, 2472 and 2575 - The site is near to a Ww TW and NW would object to the development of the site.	SHLAA 2537 & 2474 - FZ 2 & 3a	Y	Very High	Very High		
Humshaugh		Humshaugh Ww TW	River North Tyne GB103023075802	·**Combined sewer** (150-300mm) ·**SW sewer** discharges in the River North Tyne		-	-	SHLAA 2597 - A Water Main crosses the site and NW would require it to be diverted or placed within a suitable easement. The site is also near to a Ww TW and NW would object to the development of the site.	FZ 1	Y	High	High		
Barrasford		Barrasford Ww TW	River North Tyne GB103023075802	·**Combined sewer** (100-300mm)		-	-		SHLAA 2638 – FZ 2	Y	High	Very High		
Gunnerton		Gunnerton Ww TW	Gunnerton Burn GB103023074880	·**Combined sewer** (150mm) The Ww TW is on the north side of Gunnerton Burn, therefore development on the north side may be preferential to avoid the need to cross the river.		-	-		SHLA 2390 & 2528 – FZ 2 & 3a	Y	High	Very High		
Great Whittington		Great Whittington Ww TW	Bow bridge Burn GB103022076850	·**Combined sewer** (150-300mm)		-	-	SHLAA 6881 - A Public Sewer crosses the site and NW would require it to be diverted or placed within a suitable easement. The site near to a Ww TWs which by the nature of their function can produce odours which lead to customer complaints. Any development upon this site which NCC chooses to permit through the planning process should be supported by a full odour assessment. NW's response to the planning application would be dependent upon the outcome of the odour assessment	FZ 1	Y	Very High	High		
Bardon Mill / Redburn / Henshaw		Bardon Mill Ww TW	River South Tyne GB103023075710	·**Combined sewer** (75mm rising main) from Henshaw drains eastwards through Reburn and Bardon Mill, where pipe diameter increases to 150mm. However the diameter reduces to 100mm (rising main) at the Ww TW, therefore there may be limited capacity in this area.		-	-	-	FZ 1	Y	High	High		

6 INFRASTRUCTURE DELIVERY AND GUIDANCE

6.1 Site Assessment Summary

Following the individual settlement area site assessments, the outcomes have been summarised to identify the key infrastructure issues in the detailed WCS. Funding options to address these issues have been outlined. A comprehensive developer checklist is provided to offer planning application guidance to developers as to how to account for the issues raised in the detailed WCS.

6.1.1 *Wastewater Treatment and Collection Assessment*

WwTW Capacity

The detailed WCS identified several WwTW across Northumberland that currently have limited or no capacity to accept or treat any further wastewater from the proposed development and these are highlighted in Table 6-1.

These works may require an upgrade to accommodate the new development. If a new hydraulic consent is required at these works then it is likely the quality consents will be tightened to ensure no deterioration in the water environment. In the majority of cases this is likely to be achievable within current conventional treatment. However, Pegswood WwTW is at high risk as it is close to conventional treatment limits, therefore the discharge from this works will require modelling between the Environment Agency and NW.

Howdon WwTW is an important works for the settlement areas in the South East Delivery Area, such as Cramlington South West Sector, Prudhoe, Ponteland, Seaton Delaval, New Hartley and Seghill. NW are currently working with NCC and the councils for Newcastle, Gateshead, North and South Tyneside to agree a Memorandum of Understanding for flows which will ultimately discharge to this works. The removal of surface water from the sewerage system is key to freeing up additional headroom at Howdon to support growth across the five authorities.

TABLE 6-1: WWTW CAPACITY SUMMARY

Capacity Issue	WwTW
No Headroom Available – no solution currently identified but a solution is likely to be possible within limits of conventional treatment	Hepscott
	Humshaugh
	Wark
	Great Whittington
	Newbiggin
No Headroom Available – No solution available and WwTW cannot be upgraded	Tranwell
No Headroom Available until infiltration is removed	Lynemouth
	Haydon Bridge
No Headroom Available – Current NW Flow and Load investigations	Rothbury
	Cornhill on Tweed
	Seahouses
No Headroom available and likely WQ consent constraints	Pegswood
Limited Headroom Available until surface water ingress is removed	Allendale
	Barrasford
	Fourstones

TABLE 6-1: WWTW CAPACITY SUMMARY	
Capacity Issue	**WwTW**
Additional flows to be treated at Cramlington WwTW	Howdon (Cramlington SW sector)
	Stannington St Mary's

Water Quality Consents

The assessment undertaken for water quality implications in this WCS has been at a high level in the absence of sufficient data to undertake required modelling. The high level assessment is based on the assumption that additional treatment processes can be implemented at WwTWs in order to improve the quality of discharge up to the limits of conventional treatment. In some cases, this may not be possible due to site constraints (limiting the expansion of WwTWs) or funding constraints. In addition, going beyond conventional treatment may be required to main WFD status downstream.

Further detailed analysis will need to be considered and agreed between NW and the Environment Agency as part of any future application to increase the permitted discharge volumes at WwTWs with limited capacity.

Sewer Network

The detailed WCS identified the potential development area options that have a 2020 sewer capacity of 5 and/or have historical sewer flooding recorded in the area (Table 6-2), which suggests that the development is likely to exacerbate predicted hydraulic performance issue. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area.

NW have also identified potential development area options that they would object to due to the proximity of the new development to the WwTW. Therefore development should be steered away from the WwTWs or alternative potential development area options progressed for this settlement.

Other sites have been identified that are close to the WwTW, but not close enough to cause objection. Due to the nature of the WwTW function, the works can produce odours which lead to customer complaints. Any development upon these sites which NCC chooses to permit through the planning process should be supported by a full odour assessment. Therefore development should be steered away from the WwTWs or alternative potential development area options progressed for this settlement as a first choice option.

Any new development must consider the impact of further urbanisation on the existing wastewater and surface water system, and discharge of surface water must be mitigated within the pumped limitations of the drained system.

TABLE 6-2: SEWER CAPACITY SUMMARY	
Capacity Issue	**Settlement Area/Potential development area option**
2020 Sewer Capacity 5 And/or Historical Sewer Flooding	Alnwick - East of Swanwick Park
	Berwick upon Tweed
	South West Belford (1 SHLAA site)
	South of North Sunderland
	Beadnell
	South East Rothbury
	Scremerston

TABLE 6-2: SEWER CAPACITY SUMMARY	
Capacity Issue	**Settlement Area/Potential development area option**
	West, East and South West of Hexham
	Acomb (1 SHLAA site)
	South West Morpeth and Employment Area D04
	Prudhoe
	Mickley
	Corbridge
	South of Darras Hall
	West Ponteland
	Stocksfield (1 SHLAA site)
	Wylam
	Ovingham
	Horsley
	Heddon on the Wall
	Stannington
	West Amble
	Ashington
	North East, West and South West of Bedlington
	North Cambois
	Bedlington - Broadway House Farm
	Blyth - South West Newsham, Bebside and Bates Colliery Site
	South West and South East Cramlington
	North West Newbiggin
	Seaton Valley
	Lynemouth
	Hadston
	West and South West Haydon Bridge
	West Haltwhistle
	South and West Bellingham
	Bellingham – Auction Mart
	Fourstones/Newbrough
NW objections to development due to proximity to Ww TW	East and North East Wooler
	North East Alnwick
	Cornhill on Tweed (2 SHLAA sites)
	West Morpeth
	Hedley on the Hill
	South West Amble (1 SHLAA site)
	South East Amble (2 SHLAA sites)
	South West Newbiggin
	Lynemouth
	South East Haydon Bridge
	South Bellingham
	Fourstones/Newbrough
	Humshaugh

TABLE 6-2: SEWER CAPACITY SUMMARY	
Capacity Issue	**Settlement Area/Potential development area option**
NW require odour assessments as part of the planning application	Longhirst
	Longhorsley
	Scots Gap
	South West Amble (1 SHLAA site)
	East Hartford (1 SHLAA site)
	Great Whittington

6.1.2 ***Ecology and Biodiversity***

The detailed WCS has assessed the impacts of the WwTWs that would need to increase their capacity to accommodate the proposed new development on designated ecological sites (Table 6-3). The WwTWs with descriptive consents were excluded from the assessment due to their size and therefore negligible impact. Further investigation and possible infrastructure upgrades may be required in these areas before development can commence in this area. Further detailed analysis will need to be considered and agreed between NW and the Environment Agency as part of any future application to increase the permitted discharge volumes at WwTWs with limited capacity.

TABLE 6-3: ECOLOGY ASSESSMENT SUMMARY		
WwTW	**Potentially affected wildlife sites**	**Risk posed by WwTW**
Rothbury	Primarily River Coquet & Coquet Valley Woodlands SSSI into which the WwTW discharges. Also, some scope for effects on Lindisfarne SPA/ Ramsar/ SSSI/ NNR, which is known to be affected by eutrophication, and Coquet to St Mary's MCZ, although these are over 40km downstream.	**High, due to discharging into a sensitive SSSI**
Wooler	Primarily River Tweed SAC, Tweed Catchment Rivers: Lower Tweed and Whiteadder SSSI. The WwTW discharges a short distance upstream and all are known to be vulnerable to deterioration in water quality. Also, some scope for effects on Tweed Estuary SAC, Berwickshire and North Northumberland Coast SAC and Lindisfarne SPA /Ramsar /SSSI /NNR, which are known to be affected by eutrophication, although these are over 50km downstream,	**High, due to discharging a short distance upstream from a sensitive SAC and SSSI**
Scots Gap	River Wansbeck (receiving watercourse) and the white-clawed crayfish population of Wansbeck catchment	**High, due to discharging into a sensitive watercourse with a large population of white-clawed crayfish**
Pegswood	Primarily Bothal Burn (receiving watercourse, part of the Bothal Burn & River Wansbeck non-statutory nature conservation site), draining to River Wansbeck. Also potential impact on white-clawed crayfish population of Wansbeck catchment which is a short distance downstream.	**High, due to discharging upstream of a sensitive watercourse with a large population of white-clawed crayfish**
Barrasford	Possible impact on the River North Tyne, a stronghold for the Northumbrian population of freshwater pearl mussel (Northumberland being one of the two main areas for this species in England).	**High, due to discharging into a non-statutory designated site ('Tyne River North – Wark to Chollerford') designated for a species very sensitive to poor water quality**
Humshaugh		
Wark		
Haltwhistle	Haltwistle Burn (receiving watercourse), known to be currently affected by poor water quality	**Medium**
Hepscott	Primarily: Hepscott Burn (receiving watercourse), known to be currently affected by poor water quality	
Whalton	Primarily: How Burn (receiving watercourse), known to be currently affected by poor water quality	

TABLE 6-3: ECOLOGY ASSESSMENT SUMMARY		
WwTW	**Potentially affected wildlife sites**	**Risk posed by WwTW**
Alnwick	Some potential for impacts on Alnmouth Saltmarsh & Dunes SSSI, Aln Estuary MCZ, Berwickshire and North Northumberland Coast SAC, Lindisfarne SPA /Ramsar /SSSI /NNR, although these are a long way downstream.	**Medium**
Fourstones	Possible impact on Tyne & Allen River Gravels SAC into which the Ww TW discharges	**Medium**
Heddon on the Wall	None	**Low**
Allendale		
Haydon Bridge		

6.1.3 ***Water Resources Supply***

The Kielder WRZ relies on the Kielder Reservoir to meet supply demand, augment river flows and maintain other reservoir levels in times of drought to meet demand. There is a large surplus in this WRZ, therefore there is no requirement to plan a new water resource scheme to supply new developments located in this WRZ.

The Berwick and Fowberry WRZ relies on groundwater sources from the Fell Sandstone Aquifers. At present, the Berwick and Fowberry WRZ has significant licensed surplus supply, however the Environment Agency has identified uncertainty in the sustainability of the Berwick licences, therefore an NEP investigation has been planned for completion in AMP6 (2015-20) to assess the yield of the boreholes. The Environment Agency RoC may lead to a reduction in abstraction license, causing a significant reduction in DO for this WRZ after 2020. NW are currently working on a programme to refurbish and better maintain each borehole in the Berwick and Fowberry WRZ, with the aim of completion in AMP6. This will improve the output of each source and improve resilience to the WRZ. In the meantime, in order to increase the resilience of the Fowberry area, the Environment Agency has agreed to the Fowberry abstraction licence variation, which allows the current levels of abstraction to be maintained from the boreholes in that area.

It is recommended that consideration is given to developing planning policies to drive water efficiency in new developments and to ensure satisfactory provision of an adequate water supply. Consideration should also be given to developing a monitoring framework to monitor the effectiveness of such policies, especially in the Berwick and Fowberry WRZ where a resource deficit may occur if a sustainability reduction is implemented by the Environment Agency.

The following Settlement Areas are located within the Berwick and Fowberry WRZ and therefore careful consideration should be given to the siting of new developments in these areas to ensure the adequate protection of existing abstraction sources:

- Berwick upon Tweed
- Wooler
- Norham
- Cornhill on Tweed
- Scremerston

It is recommended that NW are consulted on the water supply for all proposed development in these Settlement Areas.

6.1.4 ***Fluvial/Tidal Flood Risk***

The following Settlement Areas/Potential development area options are located within Flood Zones 2, 3a or 3b and are therefore at risk of fluvial/tidal flooding:

- Berwick upon Tweed - South of Tweedmouth and Employment Area B04
- Belford – Employment Area B01
- North West and South East Seahouses
- East and North East Wooler
- Rest of North Delivery Area – Norham, Whittingham
- North and East Hexham and Employment Areas E20 and E08
- Acomb
- North, South West, West and North East Morpeth
- Prudhoe – Employment Area E12
- South East, North West and East Ponteland
- North of Darras Hall
- Rest of Central Delivery Area – Stocksfield, Wylam, Ovingham, Stannington, Longhirst
- Blyth
- Choppington/Scotland Gate
- Rest of South East Delivery Area – Lynemouth, Ellington
- Haltwhistle – Employment Area E03West and South East Haydon Bridge
- Bellingham – South and Employment Area E02
- Wark
- Birtley
- Catton
- Rest of West Delivery Area – Fourstones/Newbrough, Barrasford, Gunnerton

In accordance with the Northumberland SFRA, site-specific FRAs are required for all development in Flood Zone 2 and Flood Zone 3 and for sites greater than 1 ha in Flood Zone 1, in accordance with the NPPF. These will be reviewed either by NCC and the Environment Agency depending upon the scale and nature of the proposed development. Before allocation, the NPPF Sequential Test will need to be applied, and depending on the level of risk and vulnerability, may also need to apply the Exception Test. The objectives of a site-specific flood risk assessment are to establish:

- whether a proposed development is likely to be affected by current or future flooding from any source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- the evidence for the local planning authority to apply (if a non-allocation) the Sequential Test, and;
- whether the development will be safe and pass the Exception Test, if applicable.

New development within Flood Zones 2 and 3 should be sited in areas at lower risk of flooding in line with the sequential approach under the NPPF. Where development is located in Flood Zones 2 or 3, greater investment in flood defence and mitigation of flooding both to and from the site is likely to be required.

6.1.5 *Surface Water Management and Sustainable Drainage*

The detailed WCS used data from the Level 2 SFRA and the Environment Agency's uFMfSW to determine the general level of surface water flood risk associated with the proposed potential development area options. The majority of the potential development area options assessed are at risk of surface water flooding to some degree, therefore surface water management measures and appropriate SuDS techniques identified in the Northumberland SFRA should be used for all new developments. SuDS should be designed to support green infrastructure within developments, providing additional water quality and biodiversity benefits. The Level 2 SFRA recommends that a Surface Water Management Plan should be undertaken by NCC for primary urban areas of Morpeth, Berwick, Belford, Ponteland, Hexham, Haltwhistle, Cramlington, Amble and Blyth as identified through the Level 1 SFRA. The SWMPs will be developed subject to further assessment of local information to determine if they are required.

The assessment of the likely capacity for infiltration type SuDS showed that the following potential development area options are unlikely to be suitable for infiltration based SuDS due to low permeability superficial geology or located within a SPZ1. These sites will therefore be reliant on surface attenuation and surface water runoff restriction, which will require sites to make land provision for this mitigation:

- Berwick Employment Area B04
- South East Morpeth, East Fairmoor and Employment Area D01
- Pegswood
- Longhorsley
- South West and West Amble and Employment Area A08
- West Ashington, Ashington Hospital, West of Wansbeck Road and Employment Area F10
- Blyth – Bates Colliery Site
- Widdington Station/Stobswood
- Hadston

For potential development area options where both the permeability of the superficial deposits and bedrock is high, consideration of groundwater surface water interaction or connectivity will be required as part of the development as the ground could be free draining or allow groundwater to upwell.

Developers will also need to consider the constraints on the use of infiltration SuDS for individual development sites, with regards to pollution risk on controlled waters and groundwater levels (as described in Section 3.6).

Developers will need to engage with NCC and EA with regards to infiltration SuDS for potential development area options where groundwater surface water interaction and pollution risk are potential constraints.

6.2 Recommended Phasing of Development

The potential housing development and employment growth figures assessed in the detailed WCS have been provided by NCC and are based on the Northumberland Local Plan: Core Strategy Preferred Options for Housing, Employment and Green Belt (October 2013) and the Core Strategy Full Draft Plan (December 2014). The assessment of the potential housing development in Northumberland has been phased over four time periods, 2011-2016, 2016-2021, 2021-2026 and 2026-2031 and it has been agreed with NCC that for the detailed WCS assessment, the total proposed housing development for each settlement has been equally divided across these time periods at this point in time. It is recognised that the phasing of development may be dependent on infrastructure provision.

It has not been feasible within this detailed WCS to identify a timeline of when infrastructure constraints will impact on the phasing of development due to the following key issues:

- Water and Sewerage companies are financed for five year periods and within the current period (2015 – 2020), NW have only committed to capital projects for the first two years. All works scheduled post 2017 are subject to a June 2016 review and should growth in the catchment be at a slower rate than anticipated NW may review the start dates and invest in higher priority WwTW's.
- Headroom availability at each WwTWs is continuously impacted by operational issues, both positively and negatively, therefore an assessment based on headroom would only be accurate at the time of publication.

Considering the points above NW are unable to commit to delivering upgrades to WwTWs at a specific year in the future due to phasing of development, however, NW will continue to invest in headroom as a requirement when development is confirmed, and this will be monitored through the NCC IDP. The IDP will be updated annually to reassess infrastructure capacity and needs. This review process will be critical to capture changes and will also be a key mechanism by which the Council, NW, the Environment Agency and other stakeholders will work collaboratively to appraise investment needs, overcome any capacity constraints and address environmental considerations.

Planning applications which propose that phasing of certain development is taken forward should consult with NW to identify what infrastructure investment may be required, and when this may be feasible. Strategic approaches to development phasing should be considered for areas where developers and key stakeholders may need to work together for a larger strategic solution (for example in Morpeth).

6.3 Funding Options

6.3.1 *Section 106 Contributions*

Under Section 106 of the Town and Country Planning Act 1990 (as amended), developer contributions, also known as planning obligations, may be sought when planning conditions are inappropriate to enhance the quality of development and to enable proposals that might otherwise have been refused to go ahead in a sustainable manner.

Developer contributions are intended to ensure that developers make appropriate provision for any losses or supply additional facilities and services that are required to mitigate the impact of a development. For example affordable housing, school places, roads, pedestrian crossings and other transport facilities, open spaces or equipped playgrounds or new long term maintenance of open space, travel plans, residents parking schemes, public art, libraries and other community buildings.

Government Circular 05/2005 includes a necessity test that ensures that all developer contributions are directly linked to a specific impact of the development and that the funds acquired are to be used for that purpose. The circular states that the obligations will be:

- Necessary,
- Relevant to planning,
- Directly related to the proposed development,
- Fairly and reasonably related in scale and kind to the proposed development,
- Reasonable in all other respects.

Planning permission cannot be granted without a completed agreement in place. Developer contributions may be used to:

- Restrict development or use of the land in a specified way,
- Require specified operations or activities to be carried out on the land,
- Require land to be used in any specified way,
- Require a sum or sums to be paid to the authority on a specified date or dates.

Section 106 agreements are very frequently used in the strategic planning process for provision of key infrastructure requirements. However, in general the charge levied is required to be commensurate with the developer's impact.

Therefore, in the case of wastewater network, water supply network and surface water attenuation provision, a single Section 106 levy cannot be applied to all new development and a cost apportionment mechanism would have to be derived dependent on the level of impact each development is likely to have and this is not always a straightforward process.

6.3.2 *Community Infrastructure Levy*

The Community Infrastructure Levy (CIL) regulations came into force on 6th April 2010 and give local councils the power to apply a levy on new developments to support infrastructure delivery within their authority[44]. The money can be used to support development by funding infrastructure that the council, local community and neighbourhoods want. Authorities that wish to charge a CIL need to develop and adopt a CIL charging schedule.

In implementing a CIL, the Councils will need to ensure that the processes for infrastructure planning (e.g. through the Infrastructure Delivery Plan (IDP)) and development of the CIL charging schedule are fully integrated, involving the full range of partners, including the local strategic partnership, and with clear governance arrangements. The output should be a rolling delivery programme which will provide the basis for the CIL schedule and for review and monitoring of infrastructure delivery.

[44] Planning Advisory Service, Community Infrastructure Levy, http://www.pas.gov.uk/pas/core/page.do?pageId=122677

The detailed WCS forms an evidence base to support and inform the preparation of the Core Strategy and the allocation of future development over the plan period. The consultation on the full draft of the Core Strategy took place between December 2014 and February 2015 and the final Core Strategy is due to be adopted in Winter 2016. If the evidence demonstrates that a Community Infrastructure Levy is appropriate in Northumberland, a Draft Charging Schedule will be prepared. The Draft Charging Schedule would be subject to public consultation, before being subject to examination by an independent examiner.

The introduction of a Community Infrastructure Levy in Northumberland, would not replace the use of Section 106 agreements.

6.3.3 *Unilateral Undertaking*

A Unilateral Undertaking is an offer of specific undertaking from a developer. It is usually considered to be quicker, less costly and advantageous to the applicant/owner, as the council does not need to be a party to such a deed. It is preferable to use this rather than Section 106 when:

- There is a straightforward contribution required,
- There is no requirement for the Council to covenant to do something,
- No payback requirement is necessary,
- No affordable housing is required.

This system could work well for providing developer sums towards strategic wastewater and water supply network infrastructure as the Council do not necessarily need to covenant to provide the funding mechanism for water company infrastructure.

6.3.4 *Water Company funding*

Under the Water Industry Act 1991, an infrastructure charge may be levied on new and existing property connected to the public sewerage system for the first time. In cases where this is required in the Northumberland area, this charge will be applied directly by NW for new development that does not need new offsite infrastructure.

However, if the existing network infrastructure (water supply or wastewater) is not adjacent to a proposed site, the developer will be required to fund or at least contribute to this infrastructure through the requisition process under the Water Industry Act. The formal requisition procedures as set out in the Act (sections 41 and 98) a legal mechanism for developers to provide the necessary infrastructure to service their site.

6.3.5 *SuDS and New Development funding*

In the majority of cases, funding for the implementation of SuDS will be incurred as part of the development costs. However, to ensure that SuDs remain effective throughout the lifetime of a development, maintenance arrangements and funding will need to be agreed as part of the planning application approval. Maintenance options must identify who is responsible for maintaining such systems, how this maintenance will be funded and a minimum standard to which the SuDS must be maintained. Various options for funding are available. Maintenance and funding could originate from service management companies, water and sewerage companies, local government and private individuals.

Options and best practice for funding the maintenance of SuDS is under consideration by the Government. It is expected that further information will be forthcoming following the review of Defra and Department for Community and Local Government's (DCLG's) September 2014 SuDS consultation.

6.4 Developer Guidance

A checklist has been developed to assist developers in ensuring their development proposals meet with the requirements of the overall strategy developed for Northumberland County. This checklist is included in Appendix B. It is recommended that all developers use the WCS Developer's Checklist as part of the planning application process and submit a completed version with their planning applications. The checklist refers to different levels of policy to make it clearer to the developer as to which are driven by mandatory national and local policy and Environment Agency requirements.

The Level 2 SFRA Section 5 provides further guidance to developers on flood risk management in Northumberland. It identifies the relevant information required for developers to make informed decisions and applications, and sets out what is expected by the Council for assessments of flood risk for new or redevelopment. This includes Flood Risk Assessments, Flood Warning and Evacuation Plans and Surface Water Management (SuDS) Arrangements (Level 2 SFRA Section 5.5).

7 WCS POLICY RECOMMENDATIONS

The following WCS policy recommendations should be considered by Northumberland County Council, working in partnership with the EA and NW, to ensure that the Northumberland Local Plan considers potential limitations (and opportunities) presented by the water environment and water infrastructure on growth.

7.1 Policy Recommendations

7.1.1 *Wastewater*

WW1 – Development Phasing

Proposed developments in the WwTW catchments with limited or no capacity should be subject to a pre-development enquiry with NW to determine process capacity at the WwTW prior to planning permission being granted.

WW2 – Development and Sewerage Network

Development in the potential development areas that indicate to have potentially limited sewer network capacity (Section 4.1.3) should be subject to a pre-development enquiry with NW to determine upgrades needed to prior to planning permission being granted.

WW3 - Major Development Sites and Sewer Network

Due to the scale of the potential development, it is recommended that an overall foul and surface water strategy for the cumulative impact of development in the following areas is built into the scope of a drainage master planning exercise:

- Morpeth
- Ponteland
- Prudhoe
- Blyth, particularly in South Newsham; and
- Scremerston.

The strategy should be undertaken by NCC in partnership with NW.

7.1.2 *Water Supply*

WS1 – Water Efficiency in New Homes and Buildings

Within the Berwick and Fowberry WRZ, developers should ensure that all housing is as water efficient as possible, and non-domestic building should as a minimum reach 'Good' BREEAM status.

WS2 – Water Efficiency Retrofitting

In the potential development areas within the Berwick and Fowberry WRZ, a programme of retrofitting and water audits of existing dwellings and non-domestic buildings should be undertaken.

WS3 – Water Efficiency Promotion

In the potential development areas within the Berwick and Fowberry WRZ, a programme of water efficiency promotion and consumer education should be established, with the aim of behavioural change with regards to water use.

7.1.3 *Surface Water Management and Flood Risk*

SWM1 – Sewer Separation

Developers should ensure foul and surface water from new development and redevelopment are kept separate where possible. Where sites which are currently connected to combined sewers are redeveloped, the opportunity to disconnect surface water and highway drainage from combined sewers must be taken.

SWM2 – SuDS and Future Development

Developers should ensure that SuDS are considered for all major development sites, and minor development sites where appropriate, in line with legislative requirements and future NCC SuDS guidance

SWM3 – SuDS and Water Efficiency

Developers should ensure linkage of SuDS to water efficiency measures, including rainwater harvesting to enhance sustainability of future potential development.

SWM4 – SuDS and Green Infrastructure

Developers should ensure linkage of SuDS to green infrastructure to provide environmental enhancement and amenity, social and recreational value. SuDS design should maximise opportunities to create amenity, enhance biodiversity, and contribute to a network of green (and blue) open space.

SWM5 – SuDS and Groundwater Constraints

Developers will need to engage with NCC and EA with regards to infiltration SuDS for potential development area options where groundwater surface water interaction and pollution risk are potential constraints (as described in Section 3.6).

SWM6 – Water Quality Improvements

Developers should ensure (where possible) that discharges of surface water are designed to deliver water quality improvements in the receiving watercourse or aquifer to help meet the objectives of the Water Framework Directive.

7.2 Ecology Recommendations

The analysis undertaken within this report has identified key ecological risks and opportunities associated with the potential development sites (Section 4.3.3). The policies recommended in preceding sections will all benefit the aquatic ecology environment. In addition, it is recommended that:

- Where ecological risks resulting from proposed water cycle changes have been identified, these are considered within the relevant flood risk and surface water management proposals. These opportunities and the reduction of identified risks can be incorporated into the detailed design of the developments and local green infrastructure plans.
- The analysis indicates that particular caution is required when allocating housing to the following WwTW catchments on the basis that they have historic poorer water quality and sensitive sites and species very close to the discharge, particularly if a change to existing discharge consent parameters would be required:
    - Rothbury WwTW – discharges directly into the sensitive River Coquet & Coquet Valley Woodlands SSSI, which has traditionally had water quality issues;

- Wooler WwTW – discharges a short distance upstream of the Till Riverbank SSSI, River Tweed SAC and Tweed Catchment Rivers: Lower Tweed & Whiteadder SSSI, all of which have significant water quality constraints due to high phosphate loading;
- Whalton WwTW – discharges into the How Burn, which already has known water quality issues linked to point source and diffuse pollution; and
- Barrasford WwTW, Wark WwTW and Humshaugh WwTW – all discharge into the River North Tyne which is a stronghold for freshwater pearl mussel, which is highly sensitive to deteriorating water quality.

- In addition, development within the catchment of Scots Gap WwTW & (to a lesser extent) Pegswood WwTW will require consideration of the potential impact on the large white-clawed crayfish population of the River Wansbeck catchment. Any proposals that would result in deterioration in phosphate loading in the river and its catchment would adversely affect this population.
- In addition to point source discharges, it is recommended that a policy is devised that commits the local authority to working with landowners and other stakeholders where possible to improve diffuse pollution within the Wansbeck catchment and North Tyne in particular.

7.3 Further Recommendations

7.3.1 *Stakeholder Liaison*

It is recommended that key partners in the WCS maintain regular consultation with each other as development proposals progress.

7.3.2 *WCS Periodic Review*

It is recommended that a regular review of the WCS be undertaken to assess progress and identify any areas of change. An annual review by the core stakeholder group is suggested for this purpose. Any issues with delivery of sites or infrastructure arising in the interim should be brought to the attention of the stakeholder group for discussion as soon as possible to ensure the strategy is not compromised.

In addition, the WCS should be reviewed following future changes to the Local Plan, to ensure that it is kept up to date.

The WCS should remain a living document, and be reviewed on an annual basis as development progresses and changes are made to the various studies and plans that support it; these include:

- five yearly reviews of NW's WRMP (the next full review is due in 2019, although interim reviews are undertaken annually);
- second round of RBMP updates due by 2015;
- Periodic review 2014 (PR14) (NW's business plan for AMP6 – 2015 to 2020); and,
- Climate change impact assessment milestones.

APPENDIX A – LEGISLATIVE DRIVERS FOR THE DETAILED WCS

WATER RELATED EUROPEAN AND NATIONAL LEGISLATION/POLICY/GUIDANCE	
Directive/Legislation/ Guidance	**Description**
Birds Directive 2009/147/EC	Provides for the designation of Special Protection Areas.
Environment Act 1995	Sets out the role and responsibility of the Environment Agency.
Environmental Protection Act 1990	Integrated Pollution Control (IPC) system for emissions to air, land and water.
Flood & Water Management Act 2010	The Flood and Water Management Act 2010 is the outcome of a thorough review of the responsibilities of regulators, local authorities, water companies and other stakeholders in the management of flood risk and the water industry in the UK. The Pitt Review of the 2007 flood was a major driver in the forming of the legislation. Its key features relevant to this WCS are: • To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods. • To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SuDS for new developments and redevelopments. • To widen the list of uses of water that water companies can control during periods of water shortage, and enable Government to add to and remove uses from the list. • To enable water and sewerage companies to operate concessionary schemes for community groups on surface water drainage charges. • To make it easier for water and sewerage companies to develop and implement social tariffs where companies consider there is a good cause to do so, and in light of guidance that will be issued by the SoS following a full public consultation.
Future Water, February 2008	Sets the Government's vision for water in England to 2030. The strategy sets out an integrated approach to the sustainable management of all aspects of the water cycle, from rainfall and drainage, through to treatment and discharge, focusing on practical ways to achieve the vision to ensure sustainable use of water. The aim is to ensure sustainable delivery of water supplies, and help improve the water environment for future generations.
Groundwater Directive 80/68/EEC	To protect groundwater against pollution by 'List 1 and 2' Dangerous Substances.
Habitats Directive 92/44/EEC and Conservation of Habitats & Species Regulations 2010	To conserve the natural habitats and to conserve wild fauna and flora with the main aim to promote the maintenance of biodiversity taking account of social, economic, cultural and regional requirements. In relation to abstractions and discharges, can require changes to these through the Review of Consents (RoC) process if they are impacting on designated European Sites. Also the legislation that provides for the designation of Special Areas of Conservation provides special protection to certain non-avian species and sets out the requirement for Appropriate Assessment of projects and plans likely to have a significant effect on an internationally designated wildlife site.
Land Drainage Act 1991	Sets out the statutory roles and responsibilities of key organisations such as Internal Drainage Boards, local authorities, the Environment Agency and Riparian owners with jurisdiction over watercourses and land drainage infrastructure.

Making Space for Water, 2004	Outlines the Government's strategy for the next 20 years to implement a more holistic approach to managing flood and coastal erosion risks in England. The policy aims to reduce the threat of flooding to people and property, and to deliver the greatest environmental, social and economic benefit.
National Planning Policy Framework	Planning policy in the UK is set by the National Planning Policy Framework (NPPF). The NPPF revokes most of the previous Planning Policy Statements and Planning Policy Guidance. The accompanying NPPF Technical Guidance has also been superseded by the revised NPPF PPG published as an on-line resource in 2014. NPPF advises local authorities and others on planning policy and operation of the planning system. A WCS helps to balance the requirements of various planning policy documents, and ensure that land-use planning and water cycle infrastructure provision is sustainable.
Pollution Prevention and Control Act (PPCA) 1999	Implements the IPPC Directive. Replaces IPC with a Pollution Prevention and Control (PPC) system, which is similar but applies to a wider range of installations.
Ramsar Convention	Provides for the designation of wetlands of international importance
Urban Waste Water Treatment Directive (UWWTD)	This Directive concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. Its aim is to protect the environment from any adverse effects caused by the discharge of such waters.
Water Act 2003	Implements changes to the water abstraction management system and to regulatory arrangements to make water use more sustainable.
Water Framework Directive (WFD) 2000/60/EC	The overall requirement of the directive is that all river basins must achieve 'good ecological status' by 2015 or by 2027 if there are grounds for derogation. The WFD, for the first time, combines water quantity and water quality issues together. An integrated approach to the management of all freshwater bodies, groundwaters, estuaries and coastal waters at the river basin level has been adopted. It effectively supersedes all water related legislation which drives the existing licensing and permitting framework in the UK. The Environment Agency is the body responsible for the implementation of the WFD in the UK. The Environment Agency have been supported by UKTAG[45], an advisory body which has proposed water quality, ecology, water abstraction and river flow standards to be adopted in order to ensure that water bodies in the UK (including groundwater) meet the required status[46]. These have recently been finalised and issued within the River Basin Management Plans (RBMP).
Natural Environment & Rural Communities Act 2006	Covering Duties of public bodies – recognises that biodiversity is core to sustainable communities and that Public bodies have a statutory duty that states that "every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity
Water Resources Act 1991	Protection of the quantity and quality of water resources and aquatic habitats. Parts have been amended by the Water Act 2003. Also sets out flood defence responsibilities of the Environment Agency for main rivers
Wildlife & Countryside Act 1981 (as amended)	Legislation that provides for the protection and designation of SSSIs and specific protection for certain species of animal and plant among other provisions.
Bathing Waters Directive 76/160/EEC	To protect the health of bathers and maintain the aesthetic quality of inland and coastal bathing waters. Sets standards for variables and includes requirements for monitoring and control measures to comply with standards for bacterial levels within designated bathing waters.

[45] The UKTAG (UK Technical Advisory Group) is a working group of experts drawn from environment and conservation agencies. It was formed to provide technical advice to the UK's government administrations and its own member agencies. The UKTAG also includes representatives from the Republic of Ireland.
[46] UK Environmental Standards and Conditions (Phase I) Final Report, April 2008, UK Technical Advisory Group on the Water Framework Directive.

Marine and Coastal Access Act 2009	To help achieve clean, healthy, safe, productive and biologically diverse oceans and seas. Providing better protection for marine environment through guidance for the sustainable use of marine resources, an integrated planning system for managing seas coasts and estuaries, a robust legal framework for decision-making and streamlined regulation and enforcement.
Marine Strategy Framework Directive 2010	The directive came into force on 15th July 2008 and was transposed into UK law via the Marine Strategy Regulations and aims to achieve Good Environmental Status in Europe's seas by 2020. The directive sets out 11 high-level descriptors of Good Environmental Status that cover all key aspects of the marine ecosystem and the main human pressures on them. The key requirements of the directive are: • An assessment of the current state of UK seas by July 2012; • A set of detailed characteristics of Good Environmental Status means for UK waters, and associated targets and indicators by July 2012; • Establishment of a monitoring programme to measure progress toward Good Environmental Status by July 2014; and • Establishment of a programme of measures for achieving Good Environmental Status by 2016.

APPENDIX B – WCS DEVELOPER'S CHECKLIST

Key

Water Cycle Study Recommended Policy
Environment Agency and Natural England policy and recommendations
National Policy or Legislation

WCS DEVELOPER'S CHECKLIST			
	Flood Risk Assessment	**Next Step**	**Policy or Legislation**
1	Is the Development within Flood Zones 2 or 3 as defined by the Environment Agency's Flood Map for Planning?	Y - go to 5 N - go to 2	NPPF
2	Development is within Flood Zone 1: • Site larger than 1 Ha? • Site smaller than 1 Ha? • Site smaller than 1 Ha but in a Critical Drainage Area?	 go to 6 go to 3 go to 6	
3	Is the development residential with 10 or more dwellings or is the site between 0.5Ha and 1Ha?	Y - go to 7 N - go to 4	
4	Is the development non-residential where new floorspace is 1,000m^2 or the site is 1 Ha or more	Y - go to 7 N - go to 8	
5	The development requires a Flood Risk Assessment (in accordance with the NPPF and the relevant SFRA) and the Environment Agency are required to be consulted.	Go to 9	
6	The development requires a Flood Risk Assessment (in accordance with the NPPF and the relevant SFRA) and the Lead Local Flood Authority (Northumberland County Council) are required to be consulted.	Go to 9	
7	The development constitutes major development and is likely to require a Flood Risk Assessment (in accordance with the NPPF and the relevant SFRA) but the Environment Agency may not be required to be consulted.	Go to 9	
8	An FRA is unlikely to be required for this development, although a check should be made against the SFRA and the LPA to ensure that there is no requirement for a FRA on the grounds of critical drainage issues. Does the SFRA or does the LPA consider a Flood Risk Assessment (FRA) is required?	Y – go to 9 N – go to 10	
9	Has an FRA been produced in accordance with the NPPF and the relevant SFRA?	Y/N or N/A	
	Surface Water Runoff and Sustainable Drainage Systems (SuDS)		
10	A) What was the previous use of the site? B) What was the extent of impermeable areas both before and after development?	 % before % after	EA requirement for FRA.
11	If development is on a greenfield site, have you provided evidence that post development run-off will not be increased above the greenfield runoff rates and volumes using SuDS attenuation features where feasible (see also 18 onwards). If development is on a brownfield site, have you provided evidence that the post development run-off rate has not been increased, and as far as practical, will be decreased below existing site runoff rates using SuDS attenuation features where feasible (see also 17 onwards).	Y/N or N/A Y/N or N/A	NPPF

12	Is the discharged water only surface water (e.g. not foul or from highways)? If no, has a permit to discharge been applied for?	Y/N Y/N	Water Resources Act 1991 Environmental Permitting (England and Wales) Regulations 2010
13	A) Does your site increase run-off to other sites? B) Which method to calculate run-off have you used?	Y/N State method	NPPF
14	Have you confirmed that any surface water storage measures are designed for varying rainfall events, up to and including, a 1 in 100 year + climate change event?	Y/N	NPPF
15	For rainfall events greater than the 1 in 100 year + climate change, have you considered the layout of the development to ensure that there are suitable routes for conveyance of surface flows that exceed the drainage design?	Y/N	NPPF
16	Have you provided layout plans, cross section details and long section drawings of attenuation measures, where applicable?	Y/N	
17	The number of outfalls from the site should be minimised. Any new or replacement outfall designs should adhere to standard guidance form SD13, available from the local area Environment Agency office. Has the guidance been followed?	Y/N	Guidance Driven by the Water Resources Act 1991
18	A) Has the SuDS hierarchy been considered during the design of the attenuation and site drainage? Provide evidence for reasons why SuDS near the top of the hierarchy have been disregarded. B) Have you provided detail of any SuDS proposed with supporting information, for example, calculations for sizing of features, ground investigation results and soakage tests? See CIRIA guidance for more information. http://www.ciria.org/ItemDetail?iProductCode=C697&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91	Y/N	NPPF
19	A) Are Infiltration SuDS to be promoted as part of the development? If Yes, the base of the system should be set at least 1m above the groundwater level and the depth of the unsaturated soil zones between the base of the SuDS and the groundwater should be maximised. B) If Yes – has Infiltration testing been undertaken to confirm the effective drainage rate of the SuDS?	Y/N Y/N	
20	A) Are there proposals to discharge clean roof water direct to ground (aquifer strata)? B) If Yes, have all water down-pipes been sealed against pollutants entering the system form surface runoff or other forms of discharge?	Y/N Y/N	
21	Is the development site above a Source Protection Zone (SPZ)?	If Y go to 23 If N go to 24	Groundwater Regulations 1998
22	A) Is the development site above an inner zone (SPZ1)? B) If yes, discharge of Infiltration of runoff from car parks, roads and public amenity areas is likely to be restricted – has there been discussion with the Environment Agency as to suitability of proposed infiltration SuDS?	Y/N Y/N	Groundwater Regulations 1998

23	A) For infill development, has the previous use of the land been considered? B) Is there the possibility of contamination? C) If yes, infiltration SuDS may not be appropriate and remediation may be required. A groundwater Risk Assessment is likely to be required (formerly under PPS23) Has this been undertaken before the drainage design is considered in detail?	Y/N Y/N Y/N	NPPF
24	Have oil separators been designed into the highway and car parking drainage? Formerly under PPG23: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/290142/pmho0406biyl-e-e.pdf	Y/N	NPPF
25	Have you considered whether any of the SuDS proposed can be linked to Green Infrastructure plans?	Y/N	Section 4.6.3 Detailed WCS 2015
26	Have you produced a SuDS Maintenance Plan? Guidance on the maintenance plan is available in The SuDS Manual Update (http://www.susdrain.org/files/resources/SuDS_manual_output/paper_rp992_21_maintenance_plan_checklist.pdf)	Y/N	NPPF
	Working near or within watercourses		
27	If you are proposing to work within 5 m of a main river have you applied, and received Flood Defence Consent from the Environment Agency? OR If you are proposing work that is likely to impede the flow of water within an Ordinary Watercourse have you applied, and received Land Drainage Consent from Northumberland County Council? any works	Y/N or N/A	Water Resources Act 1991 Land Drainage Act 1991 Flood and Water Management Act 2010
	Water Consumption		
28	Have you provided details of water efficiency methods to be installed in houses? (See Section 7.1.2)	Y/N	Detailed WCS 2015
	Pollution Prevention		
29	Have you provided details of construction phase works method statement, outlining pollution control and waste management measures? See Environment Agency Pollution Prevention Guidelines 2, 5, 6 and 21 (https://www.gov.uk/government/collections/pollution-prevention-guidance-ppg) and DTI Site Waste Management Plan, (http://www.constructingexcellence.org.uk/resources/publications/view.jsp?id=2568)	Y/N	Environment Agency Pollution Prevention Guidelines 2, 5, 6 and 21
	Water Supply and Wastewater Treatment		
30	Have you provided evidence to confirm that water supply capacity is available via a pre-development enquiry with Northumberland Water Limited?	Y/N	Detailed WCS 2015
31	Have you provided evidence to confirm that sewerage and wastewater treatment capacity is available via a pre-development enquiry with Northumberland Water Limited?	Y/N	
	Conservation / Enhancement of Ecological Interest		
32	A) Have you shown the impacts your development may have on the water environment? B) Is there the potential for beneficial impacts? Have you considered, where possible the design of SuDS to deliver water quality improvements in the receiving watercourse or aquifer?	Y/N Y/N	Town and Country Planning Regulations 1999.