Central Lancashire & Blackpool

Outline Water Cycle Study
Final report

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Blackpool Borough Council
Chorley Borough Council
Preston City Council
South Ribble Borough Council
Lancashire County Council
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Revision schedule

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1 Executive Overview

Building new homes and businesses is not simply a matter of constructing the buildings themselves. To operate effectively as a home, and as part of a wider community, each building is also dependant on a range of services, and the infrastructure necessary to provide these. A critical component of this infrastructure is associated with water; the provision of clean water for drinking and washing; the safe disposal of waste water; and protection from flooding.

The addition of a small number of new homes and businesses may not represent a significant additional burden on existing water infrastructure. However when large numbers of developments are built, there is a risk that existing infrastructure will be overwhelmed, and both the environment and people's quality of life, will suffer.

There is a finite capacity within the environment, and it cannot simply provide more and more water to serve new development. Equally, there is a limit to the amount of waste water that can be safely returned to our rivers and the sea without having a detrimental impact on the environment. Furthermore, we know that extreme rainfall can overwhelm drains and overtop flood defences. Climate change is bringing fresh challenges as patterns of rainfall are predicted to change, with more intense rainfall events. We must also make sure that water infrastructure contributes to the shift to a low carbon economy that is essential if greenhouse gas emissions are to be reduced. Planning for water has to take into account these natural constraints, and factors such as the timing and location imposed by the development itself.

Blackpool Borough Council, Chorley Borough Council, Preston City Council and South Ribble Borough Council jointly comprise the Central Lancashire and Blackpool Growth Point. The main aim of the Growth Point is, as part of a national initiative, to improve the availability of housing by accelerating new construction in the period to 2017. This study has been undertaken against a background of the developing Local Development Frameworks (LDF) of Blackpool and Central Lancashire, which are due to replace the adopted local plans in Blackpool, Chorley, Preston and South Ribble once completed. The award of Growth Point (GP) status has driven the LDF appraisals with greater emphasis upon capacity of both present and future environments, whether natural and built, to accommodate and deliver the growth targets.

The water cycle strategy will be used to inform the LDF documents, sustainability appraisals, and appropriate assessments, which are subject to inspection by an independent inspector. Therefore, the water cycle strategy must provide the evidence base to ensure that development does not have a detrimental impact on the environment, and that water services infrastructure is provided in a timely manner.

The main material guide from the regional planning output during the duration of the North West Regional Spatial Strategy (RSS, 2008-2021) was that:

- 8,000 new homes should be located in Blackpool, with a target of 65% to be built on brownfield land in the Fylde Sub Region (Blackpool / Fylde & Wyre);

- 7,500 new homes should be located in Chorley, with a target of 70% to be built on brownfield land;
- 9,120 new homes should be located in Preston, with a target of 70% to be built on brownfield land;
- 7,500 new homes should be located in South Ribble, with a target of 70% to be built on brownfield land.

A water cycle study (WCS) was commissioned to provide the evidence base which will be used to support the preparation of the Core Strategies. The evidence base should demonstrate that development will not have a detrimental impact on the environment and that the necessary water infrastructure can be provided in a timely manner to support growth.

Flood Risk

Development should be safe from flooding, and should not increase flood risk elsewhere; this should include all sources of flood risk. The assessment of flood risk has considered fluvial flood risk, tidal flood risk and flooding from all sources based on the level 1 Strategic Flood Risk Assessments (SFRA).

Preston City

In general fluvial and tidal flood risk across the city is low; however certain areas such as southwest Preston and near to the centre of the city do have a medium to high level of flood risk (the Alstoms, Channel Way and Riversway sites are at high risk from fluvial flooding from the River Ribble). Further constraint to development may be presented by the Lancaster Canal. For development proposed adjacent to the canal, a Level 2 SFRA or developer led FRAs will be required to assess the residual risk from breach or overtopping of the canal. In addition there are a number of smaller settlements adjacent to the council areas which have a limited risk of fluvial and tidal flooding.

Grimsargh and its surrounding area were shown to have been particularly affected by sewer flooding. Whilst surface water and sewer flooding does not appear to be a significant issue within Preston new development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these towns.

The rural settlements within Preston City have a very limited fluvial and tidal flood risk, with only the settlements of Grimsargh and Goosnargh being at risk of fluvial and tidal flooding.

Chorley Borough

In general fluvial and tidal flood risk across the borough is low; however certain areas such as Croston do have a large proportion of development area at risk from fluvial and tidal flooding. Surface water and sewer flooding do not appear to be a significant issue within Chorley Borough limits new development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these towns.

The majority of rural settlements within Chorley Borough have a very limited fluvial and tidal flood risk, however the settlement of Croston has significant flood risk issues and potential development within the settlement could be severely constrained. Over 80% of the settlement area is situated within Flood Zone 2 and 3, with over 8% of that area within Flood Zone 3b, Functional Floodplain.

South Ribble Borough

In general fluvial and tidal flood risk across the borough is low; however certain areas such as Walton-le-Dale and Higher Walton do have a large proportion of development area at risk from fluvial flooding. In Higher Walton almost 50% of the settlement is located within Flood Zone 3b, Functional Floodplain.

Surface water and sewer flooding do not appear to be a significant issue within South Ribble Borough limits new development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these towns.

In summary it is not considered that flood risk will not be a barrier to development in the majority of settlements, because there is sufficient land at low flood risk to allow development to occur outside of flood risk areas. The key issues are identified below:

- Flood risk should not be a constraint to development in the urban settlements with only limited flood risk zones present, with the exception of Walton-le-Dale. Development in Walton-le-Dale should be located in the areas of lowest flood risk and must not increase risk to existing development and areas identified as functional floodplain should be protected from development. Where parts of development sites are proposed within Flood Zones 2 and 3, developers should undertake a site-specific Flood Risk Assessment (FRA) to establish the extent of Flood Zones 2, 3a and 3b, and the future risk of climate change. Development within Flood Zone 2 should be restricted to the 'water compatible', 'less vulnerable' and 'more vulnerable' category (see Tables D.1-D.3 in PPS25 for definitions). Development within High Probability Flood Zone 3a should be restricted to the water compatible or 'less vulnerable' uses to satisfy the requirements of the Sequential Test.

- Flood risk should not be a constraint to development in the rural settlements, with the exception of Higher Walton which has considerable flood risk present. Development within Higher Walton in Flood Zone 3b should be restricted to 'water-compatible uses' and 'essential infrastructure' that has to be there. Table D2 from PPS 25 outlines the types of development included within this classification.

Blackpool Borough

Blackpool is relatively flat low lying land, although most lies above the 1 in 1000yr (0.1%) flood extent. It is protected in the west from coastal erosion and tidal inundation from the Irish Sea by concrete defences. A number of smaller defences maintained by the EA and Blackpool council exist further inland. In general fluvial and tidal flood risk across the borough is low; however certain areas such as Anchorsholme and Thornton do have a large proportion of development area at risk from fluvial and tidal flooding. There are no areas within Blackpool within Flood Zone 3b, Functional Floodplain.

Whilst surface water and sewer flooding do not appear to be a significant issue within Blackpool Borough limits, there are known issues in Anchorsholme and Marton Moss due to reliance on and inundation of the public sewerage system. Any new development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not enter the sewer system and doe not increase the risk of surface water flooding in these areas.

Surface Water Drainage

The effect of development is generally to reduce the permeability of a site. The consequence of this, if no measures are put in place, is to increase the volume of water and the peak flow rate from the developed site during and after rainfall event. Increases in the volume of water and the peak flow rate can cause flooding to occur both within a development site, and can increase flood risk downstream of the development.

The ethos of sustainable surface water drainage is to mimic, as far as possible, the surface water flows (volume and peak flow rate) from the site prior to development. This can be achieved through drainage infrastructure which can reduce the volume of water and peak flow rate from the development site; this drainage infrastructure has become commonly known as Sustainable Drainage Systems (SUDS). SUDS are used to reduce the peak flow rate and volume of water from a development site, and SUDS techniques can be used to improve the quality of surface water runoff and provide amenity and biodiversity benefits.

As part of the WCS site specific assessments for potential development locations has been undertaken across Central Lancashire and Blackpool to identify the types of SUDS which are more likely to be broadly applicable for each potential development locations. The assessment has identified locations, at a high level which will be suitable for infiltration of surface water runoff, attenuation of surface water runoff or combination (infiltration / attenuation).

For major developments (over 500 houses) without planning permission or where a planning application had not been received, the WCS has assessed the potential storage volumes required at the sites to ensure surface water runoff rates and volume are no greater than current greenfield rates and volumes. The assessment is principally undertaken to identify, at a high level, the potential land take required to manage surface water. At these locations, the evidence indicates that no more than 1% of the development site would be taken up by storage to manage surface water runoff rate and volume. This is not considered to pose a constraint to development.

A summary of the type of SUDS suitable for each local planning authority is given below:

- In Preston City, the assessment indicates that a combination of infiltration and attenuation based SUDS approaches are likely to be suitable across the Borough. However, the nature of the underlying geology indicates that infiltration SUDS are likely to be most suitable.

- In Chorley Borough the assessment indicates that a combination of infiltration and attenuation based SUDS approaches are likely to be suitable across the Borough. However, the nature of the underlying geology indicates that attenuation SUDS are likely to be most suitable.

- The nature of the underlying geology in South Ribble Borough indicates that combination of infiltration and attenuation based SUDS approaches are likely to be suitable across South Ribble Borough.

- The nature of the underlying geology indicates that attenuation SUDS are likely to be most suitable in Blackpool Borough.

Water resources

The majority of the region is served by the Integrated Water Resource Zone which supplies 95% of the population served by UU. The Final Water Resources Management Plan 09 produced by United Utilities (UU) provides a robust plan for addressing future supply-demand balances in the North-west region. Although UU predicts over 630,000 new houses will be built in the WRZ between 2006 and 2035 the WRMP identifies that there is enough security in existing supplies and through existing demand management measures to enable resources to suffice until 2022/23, only after then will further actions be required. UU has identified that this deficit from 2022 onwards can mostly (64%) be provided by increasing supply sources. However prudent use of existing water supplies would reduce the uncertainty of the impacts of climate change upon new water sources. As the full impact of climate change is still unknown, any future sources may not be able to be relied upon.

The proportion of new houses to be built in the Blackpool and Central Lancashire WCS area over the timeframe of the WRMP represents a small proportion of the total number of new houses anticipated within the WRZ. This coupled with a positive supply-demand balance until 2022/23 means it is therefore not necessary to recommend stringent water efficiency measures for new houses at the present time. It is however recommended that planning policy be fully implemented to ensure that water efficiency is promoted. Policy makers should also be mindful that in the short to medium term there are many uncertainties surrounding factors which may impact upon water supply such as the Water Framework Directive and changes in Building Regulations which may require policy to be updated.

Wastewater Infrastructure

New development will cause additional foul flows in the sewerage system, which can result in hydraulic (i.e. physical) capacity approached or reached in both the sewerage network, and at the Wastewater Treatment Works (WwTW). Through meetings with UU, the WCS has assessed the existing capacity at WwTW and wastewater networks which will be affected by growth. It has identified where there might be capacity constraints now and in the future, and where there are proposed schemes to resolve capacity constraints.

There are 11 WwTWs in the WCS study area; details of which are summarised below:

Barton WwTW

Barton WwTW lies to the north of Preston and treats flow from a small catchment to the north of the M55. UU has indicated that there is capacity within the consent to accommodate the flow from an estimated 61 additional properties. However there is history of some flooding in the catchment, and so the point of connection to the public sewer would need to be agreed before planning consent were granted and no surface water should be routed to the wastewater network.

Blackburn WwTW

Blackburn WwTW lies to the east of Preston and treats flow from Broughton and Blackburn. UU has indicated that Blackburn WwTW presently has spare capacity, but it has been noted that there is unused capacity within the trade effluent consent of a brewery located within the WwTW catchment, and if they were to exploit this capacity, the treatment works would be fully loaded. Works improvements are on-going.

Chorley WwTW

Chorley WwTW lies just to the west of Chorley and treats flow from Euxton and surrounding areas. The Chorley WwTW is generally under capacity. However flow to Chorley is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved. The Buckshaw Village development in particular is expected to be problematic in conveying the flow to the works and UU is applying for funding to upsize the sewers in this area as part of their business plan, to be able to accept flows from the this development. The timescale for this work would be the end of the current AMP (2015). However, there is presently a risk of deterioration due to ongoing growth before the solution can be put into place.

Other developments would need a detailed look at the connection point. Sites in the northern part of the catchment would need to be referred to UU to discuss the timing of the developments. No surface water should be routed to the wastewater network.

Croston WwTW

Croston WwTW lies near the settlement of Croston and treats flow from Croston, Eccleston, Charnock Richard, Coppull and Mawdesley. An additional 454 dwellings are planned within the catchment, but there is capacity within the consent to accommodate flow from up to 900 properties. There are many local flooding issues within the catchment so any new connection points and potentially also the intermediate pump station capacities would need careful review. Any new development would need a bespoke assessment by UU. No additional surface water should be routed to the wastewater network.

Fleetwood Marsh WwTW

Fleetwood Marsh WwTW lies to the north of Blackpool and treats flow from the Blackpool area. A capital scheme to address supply demand issue has recently been completed at Fleetwood which has increased the WwTW capacity. The proposed increase in loads from development in the Blackpool area by 2026 should therefore not be a limiting factor, although it must be noted that the Fleetwood Marsh WwTW also serves sub-catchments from neighbouring districts, and these will also be subject to future growth. However there are major network capacity issues in the Blackpool and Fleetwood WwTW catchments. The main transfer tunnel south to north is overloaded and there issues with too many spills occurring during the bathing season. The projected growth is to the South of Blackpool, whereas the treatment works is to the North, and therefore the additional flow must pass through the existing, combined sewerage system, which is already overloaded.

If no deterioration in terms of spill frequency is acceptable, development cannot proceed until United Utilities are able to identify and undertake separation of surface water at least equivalent to the projected increase in foul flow. There is potentially an option for some foul flows at the south end of the catchment to go to Clifton Marsh via the Lythem/Fairhaven catchment but logistics of engineering the transfer would need to be looked at and may not be any easier than going via the current main transfer tunnel.

Overflow alleviation work is currently being undertaken in the Poulton area to satisfy local Unsatisfactory Intermittent Discharges (UIDs) and overflow spills and there possibility of taking some of the network flows from Fleetwood. In April 2012 UU will table possible solutions to the Environment Agency. UU has funding to 2012 to investigate and identify solutions but as yet has no funding beyond 2012 to implement any solutions.

Horwich WwTW

Horwich WwTW lies near to Bolton West Services off the M61 and treats flow from Horwich. There is no projected residential development in the catchment, but flows from the proposed extension to the existing motorway service stations would be received at Horwich. The projected flow from this development is not known, but there is capacity within the consent, which should be more than adequate. The WwTW is of reasonable capacity, but there are issues regarding effluent ammonia "spikes" and so some improvement to the process may be necessary to maintain compliance.

Leyland WwTW

Leyland WwTW lies to the south of the settlement of Leyland and treats flow from the south and the east of Leyland. There is projected development of approximately 2500 dwellings by the year 2026, and the treatment works will not be able to accommodate this additional load, either within its consented flow or the existing treatment units. United Utilities has a proposal to divert the flow from a significant development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available. The remaining, smaller developments can be accommodated at Leyland WwTW, although it would be necessary to agree a suitable point of connection into the network to avoid increasing the spill frequency of existing CSOs. There are also network flooding issues in the Leyland catchment and points of connection would need careful review by UU. Surface water should not be routed into the wastewater network.

Longton WwTW

Longton WwTW lies to the south of the settlement of Longton and treats flow from Hutton, New Longton and Walmer Bridge. The proposed development of 50 properties is small in relation to the existing load and the treatment works will be able to accommodate this increased flow. However if flow from the Pickerings Farm (Central Lancashire Urban Village) development were routed to Longton then it is likely that the WwTW and the network would need upgrading. There is, however a constraint with respect to the network, as the sewer which would receive this flow has recorded incidents of external flooding, and has no capacity to receive additional growth. It may therefore be necessary to undertake reinforcement, or to provide a new rising main to convey any additional flow directly to the treatment works.

Preston (Clifton Marsh) WwTW

Preston (Clifton Marsh) WwTW lies to the west of Preston and treats flow from the urban area of Preston and the western area of Walton-le-Dale, Penwortham, Freckleton, Lytham and St Annes and Kirkham. There is projected growth of over 10000 dwellings by the year 2026, but the treatment works is large and can accommodate this growth within the present consent. There are, however constraints within the network and the planning consent should not permit the addition of any additional surface water into the network, and so surface water drains will be required to convey roof and road water from the development to a suitable point of discharge.

Walton-le-Dale WwTW

Walton-le-Dale WwTW lies to the east of Walton-le-Dale and treats flow from Walton-le-Dale, Bamber Bridge and areas of the west of the M61. There is a large supply / demand project ongoing at Walton-le-Dale WwTW hence there should not be any capacity issues when this is completed. Connections of future developments and transfer of flows would need to be considered on a project by project basis. No surface water should be routed to the wastewater network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.

Wigan (Hoscar) WwTW

Wigan (Hoscar) WwTW lies to the west of the village of Parbold and treats flow from Appley Bridge and Standish. Wigan is a large works, and the projected growth is relatively small (276 dwellings to the year 2026). However there are local flooding issues in the catchment so and Wigan WwTW has known capacity issues. UU is seeking to invest £20 million to refurbish part of the process, but this represents approximately 50% of the total capacity. Further investment is required to complete the works. Small scale developments may be acceptable but large scale developments with the WwTW catchment are would be problematic. The proposed development is in Adlington at the far end of the catchment and would be conveyed to treatment via several on line pumping stations, any of which could have capacity issues. It may be feasible to divert the flow from Adlington Village to the Horwich network , which is geographically much closer, but a detailed study would be required to determine the feasibility of this option. Due to local flooding issues, surface water should not be routed to the wastewater network.

Water quality and wastewater treatment

The future expansion potential of a wastewater treatment works with respect to water quality is determined by assessing the discharge consent, set by the Environment Agency. This consent is based on the ecological sensitivity of the receiving watercourse and specifies a maximum flow and a minimum effluent quality that the WwTW has to achieve to meet water quality targets without causing environmental damage.

As the population connected to a wastewater treatment works increases, the amount of treated wastewater (or effluent) being discharged to the receiving water generally increases in proportion to the population increase. When this increased population causes the treatment works to exceed the consented maximum discharge volume allowed by the Environment Agency consent, improvements are likely to be required to the treatment works to improve the standard of treatment and to ensure river quality does not deteriorate.

In the foreseeable future, consent limits will be set with a view to meeting the requirements of the Water Framework Directive (WFD) whose aim is to ensure that good river quality standards are met throughout each waterbody. The intention is to set the discharge consent limits based upon the quality and volume of the receiving watercourse and the volume of wastewater effluent at the point of discharge. However, the means of applying these principles to an individual discharge when upstream quality is already unsatisfactory, or when upstream flow provides inadequate dilution to maintain "good" quality status using conventionally applied wastewater treatment techniques, is presently unclear.

Based on the data and information available for the outline WCS we have identified the level of growth predicted to drain to each WwTW and identified the current WFD classification of the water bodies which WwTW discharge into. Where a receiving waterbody does not currently meet good status (all but two of the water bodies assessed) it is likely that more stringent discharge consents will be needed to ensure good status is met. Any changes to the consent to meet the requirements of the WFD will be promoted through the National Environment Programme (NEP) and agreed and incorporated into United Utilities' five year business plans.

In addition a WwTW which discharges to a watercourse with greater dilution is likely to require a less stringent consent to ensure no deterioration or to meet good WFD status.

Further work will be needed to ensure that growth does not cause deterioration of current water body status and that growth does not make it more difficult to achieve good WFD status. Simplified Monte Carlo simulations can be undertaken, using the Environment Agency River Quality Planning (RQP) toolkit to identify indicative future discharge consents in light of growth

Conclusions

The key findings for the four planning authorities are provided in the main body of the report (Chapter 9-12). Summaries are provided below.

Preston City

The key findings and recommendations from the outline WCS which influence growth in Preston City are highlighted below.

- The Alstoms, Channel Way and Riversway sites are at high risk from fluvial flooding from the River Ribble. Development should not be at risk from fluvial flooding and should be prioritised away from areas at higher flood risk. A site specific Flood Risk Assessment is recommended for each location to further assess flood risk and land use should be restricted to "water compatible" or "less vulnerable" uses.

- Residual flood risk from canal breach or overtopping should be assessed by developers as part of a FRA, where development is proposed adjacent to canals (e.g. the Lancaster canal).

- In Preston, the nature of the underlying geology indicates that infiltration SUDS are likely to be most suitable.

- Where infiltration SUDS are proposed, this must be supported by a groundwater risk assessment, carried out by the developer, to ensure groundwater is not polluted. Groundwater flooding should also be considered where infiltration SUDS are proposed. The presence of Source Protection Zones (SPZs) must also be considered as part of the development proposal.

- Surface water should be kept out of the sewerage network.

- All development proposals should be discussed with UU at the earliest possible opportunity, to understand the constraints for development and potential connection locations to the network and any upgrades required.

- Preston (Clifton Marsh) and Barton WwTWs do have hydraulic capacity to accommodate growth. There are several overflow works and UID works currently on-going within the Preston (Clifton Marsh) wastewater catchment and these need to be taken into account if development sites proceed.

- Within both the Barton and Preston (Clifton Marsh) wastewater catchments any connections to the sewerage system need to be discussed with UU.

- Development within upstream areas of pumping stations, entries on the flooding register and combined sewer overflows will need to be further assessed by UU to confirm there is adequate capacity in the wastewater network to accommodate growth, and whether any upgrades are necessary.

- Early discussions should take place between the Environment Agency, the local planning authority and UU to confirm any new consents needed to serve growth.

- The study has identified WwTW catchments where there are concerns that development may cause capacity issues either at the WwTW or throughout the network. Further assessments of sustainable drainage strategies will be required in these locations. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure and to avoid any deterioration of water quality.

- If actual development differs from the proposed development used for this WCS, Preston City Council should consult with the Environment Agency to identify whether a WwTW will require a new consent to support growth, and if so the nature of the consent.

Chorley Borough

The key findings and recommendations from the outline WCS which influence growth in Chorley Borough are highlighted below.

- Croston is at high risk from fluvial flooding. Development should not be at risk from fluvial flooding and should be prioritised away from areas at higher flood risk. A level 2 SFRA is recommended to further assess flood risk if proposed development is in Flood Zone 2 and 3. The level 2 SFRA should also assess the implication of development behind flood defences, where necessary.

- Residual flood risk from canal breach or overtopping should be assessed by developers as part of a FRA, where development is proposed adjacent to canals.

- Sewer flooding has been known to be an issue around Euxton.

- The nature of the underlying geology in Chorley Borough indicates that attenuation SUDS are likely to be most suitable.

- Where infiltration SUDS are proposed, this must be supported by a groundwater risk assessment, carried out by the developer, to ensure groundwater is not polluted. Groundwater flooding should also be considered where infiltration SUDS are proposed.

- Surface water should be kept out of the sewerage network.

- Foul flows from new developments can be reduced through implementation of water efficiency measures and metering of all new development. This will reduce the new net burden on the wastewater network and at the WwTW.

- All development proposals should be discussed with UU at the earliest possible opportunity, to understand the constraints for development and potential connection locations to the network and any upgrades required.

- There is hydraulic capacity at Chorley WwTW to accommodate growth. However constraints exist within the network capacity and the Buckshaw Village development in particular is expected to be problematic in conveying the flow to the works. UU is applying for funding to upsize the sewers in this area as part of their business plan.

- Increased flow at Croston works should not be an issue until after 2031 when a major capital works scheme is complete. However individual assessments of development sites will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge.

- The developer should discuss any new sewerage infrastructure with UU for developments linking to Horwich WwTW.

- There is a large supply / demand project ongoing at Walton-le-Dale WwTW hence there should not be any capacity issues when this is completed circa 2014. The design horizon increase in capacity should be adequate to accommodate the estimated flow from the dwellings proposed to the year 2026. There are several UID projects ongoing in the catchment. Connections of future developments and transfer of flows would need to be considered on a project by project basis. No surface water should be routed to the wastewater network.

- There is hydraulic capacity at Wigan (Hoscar) WwTW to accommodate growth. However there are local flooding issues in the catchment so consideration of the wastewater network will be needed.

- Within the Chorley and Walton-le-Dale and Wigan WwTWs catchments any connections to the sewerage system need to be discussed with UU.

- Development within upstream areas of pumping stations, entries on the flooding register and combined sewer overflows will need to be further assessed by UU to confirm there is adequate capacity in the wastewater network to accommodate growth, and whether any upgrades are necessary.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management" opportunities to improve the sewer infrastructure should be pursued and the capacity and timing of development should be managed to avoid exceeding sewer infrastructure capacity.

- The study has identified WwTW catchments where there are concerns that development may cause capacity issues either at the WwTW or throughout the network. Further assessments of sustainable drainage strategies will be required in these locations. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure and to avoid any deterioration of water quality.

- If actual development differs from the proposed development used for this WCS, Chorley Borough Council should consult with the Environment Agency to identify whether a WwTW will require a new consent to support growth, and if so the nature of the consent.

South Ribble Borough

The key findings and recommendations from the outline WCS which influence growth in South Ribble Borough are highlighted below.

- Walton-le-Dale is at high risk from fluvial flooding. Development should not be at risk from fluvial flooding and should be prioritised away from areas at higher flood risk. A level 2 SFRA is recommended to further assess flood risk if proposed development is in flood zone 2 & 3. The level 2 SFRA should also assess the implication of development behind flood defences, where necessary. Development within Flood Zone 2 should be restricted to the 'water compatible', 'less vulnerable' and 'more vulnerable' category (see Tables D.1-D.3 in PPS25 for definitions). Development within High Probability Flood Zone 3a should be restricted to the water compatible or 'less vulnerable' uses to satisfy the requirements of the Sequential Test.

- Flood risk should not be a constraint to development in the rural settlements, with the exception of Higher Walton which has considerable flood risk present. Development within Higher Walton in Flood Zone 3b should be restricted to 'water-compatible uses' and 'essential infrastructure' that has to be there. Table D2 from PPS 25 outlines the types of development included within this classification. A level 2 SFRA is recommended should development be proposed in Higher Walton.

- The nature of the underlying geology in South Ribble Borough indicates that combination of infiltration and attenuation based SUDS approaches are likely to be suitable across the Borough.

- Where infiltration SUDS are proposed, this must be supported by a groundwater risk assessment, carried out by the developer, to ensure groundwater is not polluted. Groundwater flooding should also be considered where infiltration SUDS are proposed. The presence of Source Protection Zones (SPZs) and nitrate vulnerable zones must also be considered as part of the development proposal.

- All development proposals should be discussed with UU at the earliest possible opportunity, to understand the constraints for development and potential connection locations to the network and any upgrades required.

- There is hydraulic capacity at Chorley WwTW to accommodate growth. However constraints exist within the network capacity and any connections to the network need to be discussed with UU. Surface water should be kept out of the wastewater network. Developments need to be discussed with UU.

- Developments in the Leyland catchment need to be discussed with UU. There are concerns about the capacity at Leyland WwTW and there are also network flooding issues in the Leyland catchment and points of connection to the network would need careful review by UU. Surface water should be kept out of the wastewater network.

- Longton WwTW has hydraulic capacity to accommodate growth. Surface water should be kept out of the wastewater network.

- There is a large supply / demand project ongoing at Walton-le-Dale WwTW hence there should not be any capacity issues when this is completed circa 2014. The design horizon increase in capacity should be adequate to accommodate the estimated flow from the dwellings proposed to the year 2026. There are several UID projects ongoing in the catchment. Connections of future developments to the network, and transfer of flows, would need to be considered by UU on a project by project basis. No surface water should be routed to the wastewater network.

- Development within upstream areas of pumping stations, entries on the flooding register and combined sewer overflows will need to be further assessed by UU to confirm there is adequate capacity in the wastewater network to accommodate growth, and whether any upgrades are necessary.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management" opportunities to improve the sewer infrastructure should be pursued and the capacity and timing of development should be managed to avoid exceeding sewer infrastructure capacity.

- The study has identified WwTW catchments where there are concerns that development may cause capacity issues either at the WwTW or throughout the network. Further assessments of sustainable drainage strategies will be required in these locations. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure and to avoid any deterioration of water quality.

- In general WwTW which discharge to watercourses with a higher dilutive capacity should be considered preferable for growth, because the WwTW will have a lower impact on the watercourse.

- If actual development differs from the proposed development used for this WCS, South Ribble Borough Council should consult with the Environment Agency to identify whether a WwTW will require a new consent to support growth, and if so the nature of the consent.

Blackpool

The key findings and recommendations from the outline WCS which influence growth in Blackpool Borough are highlighted below.

- There are surface water and sewer flooding issues in Anchorsholme and Marton Moss due to reliance on and inundation of the public sewerage system. New development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these areas.

- The nature of the underlying geology indicates that attenuation SUDS are likely to be most suitable in the Borough.

- Fleetwood Marsh WwTW does have hydraulic capacity; however the network is severely constrained.

- There are major network capacity issues in the Fleetwood Marsh catchment. It is recommended that with a potential main focus for strategic levels of new development within Blackpool at Marton Moss and on the edge of Blackpool in Fylde as part of the wider M55 Hub, **no further development should be permitted beyond existing allocated sites** until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole.

- Surface water should be kept out of the sewerage network. The removal of the automatic right to connect in the Floods and Water Management Act, will help sewerage undertakers reduce surface water connections to the sewerage network. It is recognised that in some locations there will be no practicable alternative other than connecting surface water to the sewerage network, but it is the responsibility of the developer to demonstrate that all other possible drainage alternatives have been explored in the first instance.

- Foul flows from new developments can be reduced through implementation of water efficiency measures and metering of all new development. This will reduce the new net burden on the wastewater network and at the WwTW.

- The study has identified WwTW catchments where there are concerns that development may cause capacity issues either at the WwTW or throughout the network. Further assessments of sustainable drainage strategies will be required in these locations. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure and to avoid any deterioration of water quality.

- If actual development differs from the proposed development used for this WCS, Blackpool Borough Council should consult with the Environment Agency to identify whether a WwTW will require a new consent to support growth, and if so the nature of the consent.

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1 Introduction

1.1 Background to the water cycle study

Building new homes and businesses is not simply a matter of constructing the buildings themselves. To operate effectively as a home, and as part of a wider community, each building is also dependant on a range of services, and the infrastructure necessary to provide these. A critical component of this infrastructure is associated with water; the provision of clean water for drinking and washing; the safe disposal of waste water; and protection from flooding.

The addition of a small number of new homes and businesses may not represent a significant additional burden on existing water infrastructure. However when large numbers of of developments are built, there is a risk that existing infrastructure will be overwhelmed, and both the environment and people's quality of life, will suffer.

There is a finite capacity within the environment, and it cannot simply provide more and more water to serve new development. Equally, there is a limit to the amount of waste water that can be safely returned to our rivers and the sea without having a detrimental impact on the environment. Furthermore, we know that extreme rainfall can overwhelm drains and overtop flood defences. Climate change is bringing fresh challenges as patterns of rainfall are predicted to change, with more intense rainfall events. We must also make sure that water infrastructure contributes to the shift to a low carbon economy that is essential if greenhouse gas emissions are to be reduced. Planning for water has to take into account these natural constraints, and factors such as the timing and location imposed by the development itself.

Blackpool Borough Council, Chorley Borough Council, Preston City Council and South Ribble Borough Council jointly comprise the Central Lancashire and Blackpool Growth Point (Figure 1-1). The main aim of the Growth Point is, as part of a national initiative, to improve the availability of housing by accelerating new construction in the period to 2017. Growth points are required to carry out water cycle studies as part of their growth point status. In 2009 a Scoping Study for all the North West growth point areas was commissioned by the Environment Agency. This stage is to prepare an Outline Water Cycle Study.

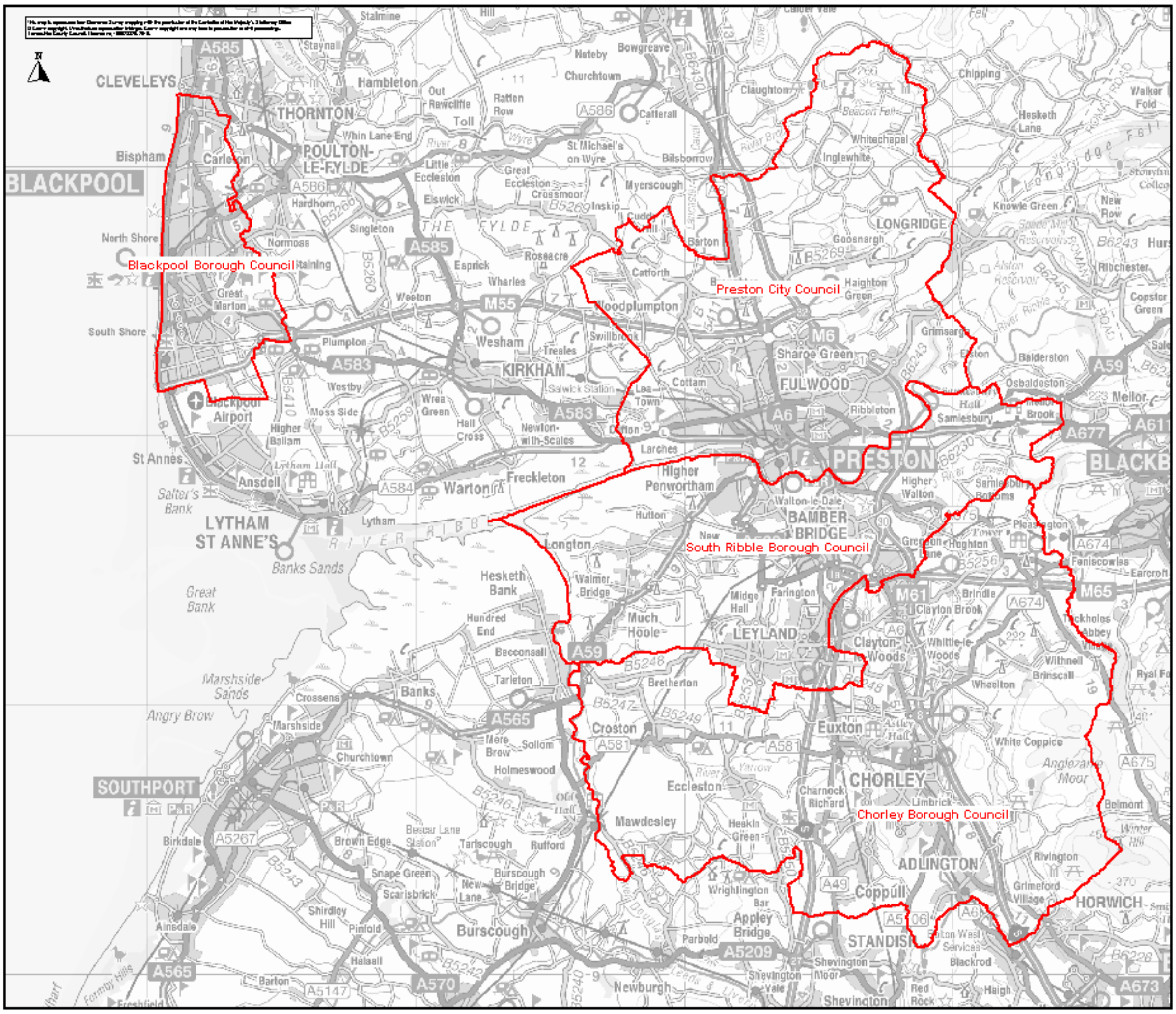


Figure 1-1 Study area

The four planning authorities are currently preparing, or have prepared, their draft Core Strategies, as part of the Local Development Framework (LDF) process. Chorley, Preston and South Ribble are preparing a joint Core Strategy (for "Central Lancashire"). LDF documents submitted to the Secretary of State must include demonstrable evidence of a strategic approach within their evidence base. An integrated Water Cycle Strategy provides the ideal means by which to address this need and can be undertaken in a phased manner to suit the staged levels of detail required by the planning process.

To this end a water cycle study (WCS) has been commissioned to provide the evidence base which will be used to support the preparation of the Core Strategy. The evidence base should demonstrate that development will not have a detrimental impact on the environment and that the necessary water infrastructure can be provided in a timely manner to support growth.

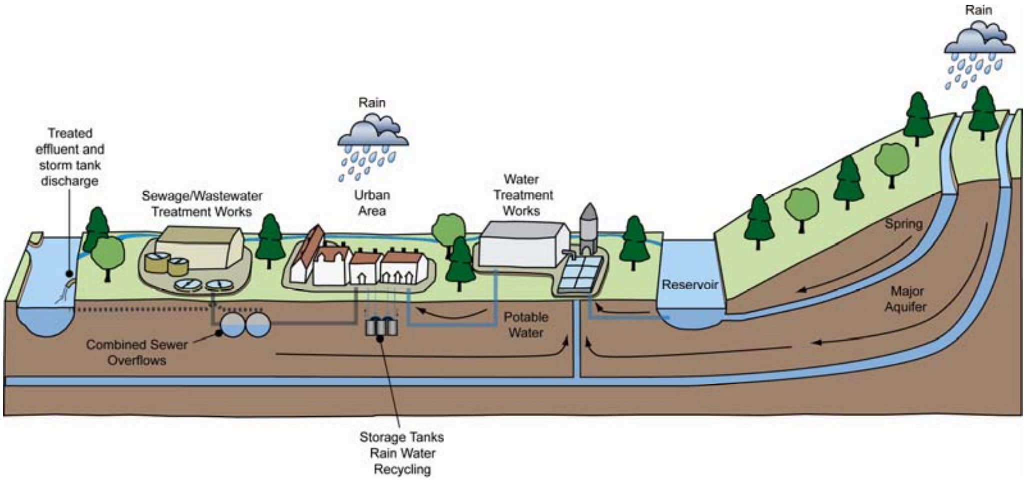
Halcrow Group Ltd was commissioned to undertake a WCS for the four planning authorities in the growth point area, in consultation with the Environment Agency and Unitied Utilities. The Environment Agency and Unitied Utilities provided input, and data and information throughout the WCS.

1.2 Water cycle processes

The water cycle includes the processes and systems that collect, store, or transport water in the environment. Water cycle processes are both above and below ground level, and can be either natural or man-made. In an undeveloped area, the water cycle includes rainfall landing on the ground, where it is either transferred into above ground streams, rivers, wetlands, floodplains, and estuaries to the sea, or is absorbed into the soil, ending up in groundwater storage aquifers. The cycle is completed by evaporation from these systems back into the atmosphere.

In a developed area, the natural processes and systems are sometimes adapted for development or public health reasons. For example, water is taken from rivers, treated, and piped via water supply systems into urban areas. Wastewater produced by houses is collected in a below ground sewerage system, where it is transported to a wastewater treatment works before being discharged to the sea, rivers or to groundwater.

The natural processes are extremely important for wildlife and ecology, and even man made systems can have biodiversity and wildlife interest. It is important than when building new homes, or even redeveloping existing areas we understand the impact on the natural environment.



1.3 Objectives of the water cycle study

As defined in the brief the objectives of the WCS are to:

- Confirm and agree the steering group identified by the scoping study;
- Identify environmental risks and constraints;
- Identify if environmental resources can cope with further development;
- Identify if development might overload the existing infrastructure;
- Identify if major new infrastructure or management interventions are needed to allow development;
- Help pinpoint if there is water cycle capacity for new development without needing to build major new infrastructure;
- Provide the evidence base for the local planning authority's Core Strategy, and;
- Provide an outline water cycle strategy agreed by all partners, where appropriate.

The water cycle study will be used to inform the planning authorities' LDF documents, sustainability appraisals, and appropriate assessments, which are subject to examination by an independent inspector. Therefore, the water cycle study must provide the evidence base to ensure that development does not have a detrimental impact on the environment, and that water services infrastructure is provided in a timely manner.

1.4 Approach adopted for the water cycle study

The approach adopted for the WCS was mapped against the Environment Agency guidance on undertaking water cycle studies[1]. The Environment Agency guidance highlights a three-stage process for WCS; scoping, outline and detailed. The guidance suggests that the need for a detailed WCS is identified as an output from the outline WCS. A detailed WCS is only required where an outline WCS identifies the need for one. An outline study should scope out any further work required.

When mapped to the Environment Agency guidance, the Central Lancashire and Blackpool WCS can be considered as an outline WCS.

Where proposed strategic sites (or preferred options) have been identified as part of the draft Core Strategy the approach adopted sought to identify the environmental and infrastructure constraints within these sites, and the options to mitigate constraints. The key questions to be addressed for the strategic sites included:

- Is there sufficient wastewater capacity in the network and at the sewage treatment works?
- Is there sufficient water supply capacity in the network?
- If not has capacity been planned (or can it be achieved)?
- Is there sufficient land at lower flood risk?
- What surface water policies will need to be in place?
- Are there ecological constraints within the strategic allocations?

1.5 Report structure

The report has been structured to facilitate each of the partner authorities. Chapter 2 provides a discussion on the regional planning context of the WCS. Chapter 4 discusses the regional assessment of water resources and demand management undertaken as part of the WCS, chapter 5 provides an overview of flood risk and chapter 6 provides an overview surface water management. Chapters 7-11 provide a summary of the WCS findings for each partner authority.

[1] http://publications.environment-agency.gov.uk/pdf/GEHO0109BPFF-e-e.pdf

2 Regional planning context

2.1 Background

This study has been undertaken against a background of the developing Local Development Frameworks (LDF) of Blackpool and Central Lancashire, which are due to replace the adopted local plans in Blackpool, Chorley, Preston and South Ribble once completed. The award of Growth Point (GP) status has driven the LDF appraisals with greater emphasis upon capacity of both present and future environments, whether natural and built, to accommodate and deliver the growth targets.

Since the investigations and findings of this study are directly part of the LDF investigations, it is important that the development forecasts upon which the LDF will be based are clearly understood and that, in turn, the implications of those forecasts are acknowledged within the LDF. This chapter of the Water Cycle Strategy records the background for the LDF process and the development scenarios being proposed and considered by Blackpool and Central Lancashire in order that these may be clearly understood alongside the Water Cycle Study investigations. In addition, this then enables the outcome of those investigations to be clearly correlated against the LDF scenarios and the implications for the LDF targets to be clearly communicated to all parties that use and rely upon the Strategy in the future.

2.2 Regional Planning

The development scenarios that Blackpool and Central Lancashire have generated under their LDFs and Strategic Housing Land Availability Assessment (SHLAA) process and which have been used in assessing the potential capacity-needs and provisions are described together with forecasts for the phasing of the growth delivery. The latter element enables comparisons with the abilities of partner organisations to plan and provide the necessary strategic infrastructure to support such growth and to review against known and emerging trends in the natural environment.

The emerging LDF documents have been formulated with the use of the regional plan for the North West, the North West Regional Spatial Strategy (the RSS). However, following the letter from Rt. Hon. Eric Pickles, the Secretary of State for Communities and Local Government, in May 2010, regional plans were revoked in favour of a more localised planning system. It is uncertain what impact the removal of the regional strategy will have on the dispersal or focus of development within the Blackpool and Central Lancashire area. Whereas the regional strategy provided clear targets and strategic locations for development, growth locations will now be less certain and may be more dispersed. On November 10th 2010 a judicial review found that the Coalition Government acted unlawfully in revoking regional plans without having primary policy in place, therefore the RSS still stands and will be in place until such a time that the revocation of it can be seen as lawful. Notwithstanding this, it is still a policy of the new Government to abolish regional planning in the long term, and the government intends to achieve this through the Decentralisation and Localism Bill, which has been laid before Parliament in December 2010.

The regime change and subsequent uncertainty over the future of planning policy has resulted in the emerging LDFs in Blackpool and Central Lancashire being delayed whilst the Councils decide how to proceed in light of the Coalition Government's actions concerning changes to housing and planning powers including the abolition of the Regional Strategy.

However, as discussed, the emerging LDFs have been developed through the use of the RSS until this time. The RSS is based on a series of core objectives and regional priorities, from which the policies follow on. It is expected that these objectives will continue to be taken through into the LDFs of Blackpool and Central Lancashire, as they have formed a core part of the emerging consultation documents. Objectives of particular relevance to the WCS are to:

- promote sustainable communities;
- promote sustainable economic development;
- make the best use of existing resources and infrastructure;
- marry opportunity and need;
- promote environmental quality;
- reduce emissions and adapt to climate change.

The regional priority for development set out in the RSS in the Central Lancashire Region seeks to focus the majority of development in the growth point area. The RSS makes specific reference to sites not being released for housing development unless sufficient capacity including water supply and waste-water treatment exists or can be provided ahead of the development without environmental harm in line with Policy EM 5 (shown below). The relevance of the (water) environment to the planning of future growth and redevelopment is therefore central to regional planning as well as to the local-level.

The LDF, which comprises a suite of planning policy documents, is driven by recent government legislation that has comprehensively changed the planning system since the existing local plans were adopted. The LDF system has been designed to streamline the local planning process and promote a proactive, positive approach to managing development and PPS12 was published in summer 2008 to direct this new system.

Central to the LDF is the Core Strategy and Development Policies Development Plan Document (DPD). The DPDs will set out the basic principles and policy direction for planning and development in Blackpool up to 2026. This will, over time, be complemented by appropriate neighbourhood planning documents setting out site allocations. Collectively, these DPDs will form the LDF and will be the basis for decision-making for the delivery of the growth sought under the GP targets. The work on the LDF components will, up until this point, have drawn upon the regional aspirations as laid out in the Regional Plan and the Core Strategy DPDs, however, as discussed above, the emerging Core Strategy will no longer be guided by the Regional Plan, although it remains to be seen how the Core Strategy and subsequent DPDs will use Regional Planning guidance in its development.

Blackpool Council has already consulted extensively over the Core Strategy, most recently the Preferred Options draft was completed for consultation in April 2010. Blackpool also undertook further consultation in November 2010 on proposed revised housing numbers as an initial response to the Government's changes in planning powers and the realities of the housing market. Blackpool Council has commissioned a number of parallel and evidence base studies that affect or may be affected by the Water Cycle Study (WCS).

Policy EM 5

Integrated Water Management

In achieving integrated water management and delivery of the EU Water Framework Directive, plans and strategies should have regard to River Basin Management Plans, Water Company Asset Management Plans, Catchment Flood Management Plans, and the Regional Flood Risk Appraisal. Local planning authorities and developers should protect the quantity and quality of surface, ground and coastal waters, and manage flood risk, by:

- working with the Water Companies and the Environment Agency when planning the location and phasing of development. Development should be located where there is spare capacity in the existing water supply and waste water treatment, sewer and strategic surface water mains capacity, insofar as this would be consistent with other planning objectives. Where this is not possible development must be phased so that new infrastructure capacity can be provided without environmental harm;
- producing sub-regional or district level strategic flood risk assessments, guided by the Regional Flood Risk Appraisal. Allocations of land for development should comply with the sequential test in PPS25. Departures from this should only be proposed in exceptional cases where suitable land at lower risk of flooding is not available and the benefits of development outweigh the risks from flooding;
- designing appropriate mitigation measures into the scheme, for any development which, exceptionally, must take place in current or future flood risk areas, to ensure it is protected to appropriate standards, provides suitable emergency access under flood conditions, and does not increase the risk of flooding elsewhere;
- requiring new development, including residential, commercial and transport development, to incorporate sustainable drainage systems and water conservation and efficiency measures to the highest contemporary standard;
- encouraging retrofitting of sustainable drainage systems and water efficiency within existing developments;
- raising people's awareness of flood risks (particularly for vulnerable groups) and the impacts of their behaviours and lifestyles on water consumption.

A Level 1 Strategic Flood Risk Assessment (SFRA) was completed by Blackpool Council in December 2009. This has been used to inform the flood-related elements of this Strategy.

The decision was made by Chorley, South Ribble and Preston to work jointly on LDF documents that would guide development in the three Districts. The joint Preferred draft Core Strategy was issued for consultation in September 2008 and the Publication draft in December 2010. A number of changes occurred between the publication of these two documents, such as the economic downturn and the commitment to the Growth Point initiative. The Central Lancashire authorities were due to produce the Publication Core Strategy in April 2010, however this was delayed in the light of the Coalition Government's actions concerning changes to housing and planning powers including the intended revocation of the Regional Spatial Strategies. Work was also commenced on Site Allocations and by December 2010 issues and options consultation had commenced. This Water Cycle Study has been able to assess the water issues associated with the strategic development sites emerging in the Core Strategy and all the other significant potential sites in the Site Allocations work.

A number of representations to the Preferred Core Strategy made references to flood-risk policy and the water environment. These included comments on water and sewage treatment and concern over development exacerbating flooding.

Central Lancashire's evidence base includes key documents that have helped develop the emerging LDF including a Strategic Housing Land Availability Assessment (SHLAA) and the Central Lancashire and Blackpool Growth Point Impact Study.

Blackpool and Central Lancashire were awarded Second Round GP status in July 2008. The GP's vision set out the following targets for the area:

The delivery of 21,200 homes by 2016/17, representing an accelerated provision of 5,000 homes above RSS targets between 2008/9 and 2016/17:

- The delivery of at least 4,000 affordable homes integrated within new mixed-tenure developments;
- The delivery of a co-ordinated service infrastructure linked to the accelerated delivery of new housing; and,
- Associated new employment development.

To date, approximately 6,500 new homes have either already been built or are currently committed in Blackpool and the Central Lancashire authorities. The outstanding target of just over 21,000 new dwellings and the corresponding employment/ancillary assets remains to be delivered over the next seven years. The main material guide from the regional planning output during the duration of the RSS (2003-2021) was that:

- 8,000 new homes should be located in Blackpool, with a target of 65% to be built on brownfield land in the Fylde Sub Region (Blackpool / Fylde & Wyre);
- 7,500 new homes should be located in Chorley, with a target of 70% to be built on brownfield land;
- 9,120 new homes should be located in Preston, with a target of 70% to be built on brownfield land;
- 7,500 new homes should be located in South Ribble, with a target of 70% to be built on brownfield land.

Potential development locations are given in Figures 2-1 to 2-4 in Appendix A. The emerging Blackpool LDF identifies that the main focus of growth in Blackpool will be focussed around the revitalisation and regeneration of the town centre and resort core. In addition further growth and expansion will be focussed around Marton Moss/M55 Hub as part of the sustainable urban extension on the edge of Blackpool. Table 2-1 details the strategic housing sites to meet Blackpool's need between 2010 and 2026 that are identified in the emerging Blackpool Core Strategy.

Location	No. of dwellings required
Central Blackpool Inner Area Development Sites	2,000
Strategic Development Site at M55 Hub / Marton Moss	2,700
Other housing development sites identified in SHLAA including: Talbot Gateway Blackpool and the Fylde College (Bispham site) Former Devonshire Road Hospital Leys Nursery Ryscar Way	1,700
Windfall allowance for conversions	1,000
Total	**7,400**
Completed dwellings 2003-2010	2,000
Sites under construction or with planning permission at 1st April 2010	1,400
Overall total	**10,800**

Table 2-1 Blackpool Strategic Housing Sites 2010-2026

In response to the revocation of the Regional Spatial Strategy and recent housing trends, Blackpool Council in November 2010 published the Blackpool Core Strategy – The Need for New Homes to 2026 document which sought views on the housing requirement for Blackpool. It is proposed the following amendments are made to the above targets (revised to 2027) to provide a more accurate assessment of the current and future political, planning and economic situation;

- It is recommended that the *Central Blackpool Inner Area Sites* target remains the same due to additional housing stock created from resort regeneration;
- A slightly reduced target for *other housing development sites* of 1,500 new dwellings, giving a more accurate reflection of the expected requirement for housing due to the current housing market downturn;
- The *windfall allowance* will remain unchanged; and,

- The *strategic development site at Marton Moss* target should be reduced from 2,700 to around 1,500 dwellings due to the current economic climate and reduced housing targets within the RSS.

Although this is not an adopted document it identifies the aspiration of the Council to significantly reduce the amount of housing to be developed in Blackpool up until 2027.

The emerging Central Lancashire Core Strategy sets out the approximate distribution of housing development in Central Lancashire up to 2026. It is detailed that 15% of total dwellings are proposed in the Preston/South Ribble urban area will be developed at Strategic Sites and Locations. In total, 25% of the proposed dwellings in the Core Strategy will be developed in Strategic Sites and Locations. Table 2-2 sets out the proposed distribution of housing the LDF area:

Location	Total %
Preston/South Ribble Urban Area	45
Buckshaw Village Strategic Site	10
Key Service Centres	30
Urban Local Service Centres	9
Rural Local Service Centres and Elsewhere	6
Total	100

Table 2-2 Distribution of housing in the Central Lancashire LDF.

Strategic Sites are to be located at BAE Systems Samlesbury, Cuerden and Buckshaw Village. There are also proposed strategic sites at Cottam and Central Preston, including the Tithebarn Regeneration Area, Central Business District and Inner East Preston.

In addition 501 hectares of land for employment development is allocated for development between 2009 and 2026. Regional and sub-regional office developments will be located in Preston City Centre including the Central Business District area and the Tithebarn Regeneration Area, with more local office schemes in Chorley and Leyland town centres.

2.3 Development Phasing

The LDFs will cover a period of between 15 and 20 years. Despite current development rates considerably reduced due to the downturn in the development market, a number of outline applications have been received for the large expansion sites within the region. These developments including Marton Moss, Buckshaw Village and other strategic locations, however it is yet to be seen how the economic downturn will affect this development.

Central Lancashire seek to ensure there is enough deliverable land suitable for housing capable of providing a continuous forward looking 5 year supply in each authority from the start of each annual monitoring period and in locations that are in line with the Spatial Strategy Policy.

The information provided from the main development schemes is that delivery of such large projects is expected to spread out over a considerable period, extending up to the end of the LDF timeframe (to 2026) and beyond. Whilst outline planning applications have been received for certain of the large projects proposed within the Growth Point document, some of these developments have not yet commenced, this situation has been compounded by the current uncertainty as the planning system goes through a period of change under the new Coalition Government. The timing and duration of other smaller sites is unknown and has not been investigated.

Table 2-3 details notable developments within the study area that have, or are due to obtain, planning permission for development.

Development	Type of Development	Amount of Development	Size (ha)	Status
South Ribble				
Farington Park, east of Wheelton Lane	Residential	470 dwellings	3	Planning permission minded to approve subject to s106 agreement
Preston				
Tithebarn Regeneration Area	Mixed Use	500 dwellings and 20,000 m^2 office space	22.8	Outline permission (may be subject to judicial review)
GOSS Graphics	Residential	358 dwellings	3.8	Planning permission minded to approve subject to s106 agreement
Queen Street Countryside Properties	Residential	352 dwellings	3.2	Planning permission granted
Whittingham Hospital	Mixed Use	650 dwellings 900m^2 B1 office space	51.6	Outline permission
Chorley				
Buckshaw	Residential	1235 dwellings	44.3	Planning

Development	Type of Development	Amount of Development	Size (ha)	Status
Village				permission minded to approve subject to s106 agreement
Former Lex Auto Logistics Site, Pilling Lane	Residential	320 dwellings	10.1	Planning permission minded to approve subject to s106 agreement
Site 5, 7 and 9, Buckshaw Avenue, Buckshaw Village	Residential (Southern Commercial)	787 dwellings & 50,346 m^2 employment space	9.1	Planning permission granted – development commenced
Buckshaw Village Group 1	Residential	769 dwellings		Planning permission minded to approve subject to s106 agreement
Blackpool				
Marton Moss: Bennets Lane/Progress Way (M55 Growth Hub)	Residential	500	20.2	Planning application granted – subject to legal challenge
Rigby Road Site	Mixed Use	350	6.5	Planning application to be submitted in 2011

Table 2-3 Existing and forthcoming permitted development in Blackpool and Central Lancashire

2.4 Cross Boundary Issues

As well as the influence of the four local authorities within the study area, the water cycle within the Blackpool and Central Lancashire is also affected by factors beyond the administrative borders of the study area. A number of neighbouring authorities have similar aspirations towards future growth, particularly Greater Manchester, the

Mersey area and Pennine Lancashire. Enquiries have therefore been made in order to ascertain what key factors might have influence within the District from external sources.

As part of the Manchester City, Salford City and Trafford Council SFRA it is recommended that water cycle studies are undertaken by all Greater Manchester councils to identify specific locations where further and more detailed flood risk data and assessment work is required. It is inferred that a Greater Manchester WCS would consider water supply, waste water treatment and disposal, and any related flooding issues, within the current regulatory framework that exists and consequent funding availability, and would link to SFRAs and SWMPs, amongst other things.

The Pennine Lancashire Housing Market Renewable (HMR) Area, is a government funded initiative to revitalise housing markets in areas of low demand and poor housing quality. Pennine Lancashire has identified a number of strategic and prestige sites about which the economy can be restructured and grown. These include the Blackburn Knowledge Zone, an 80 acre Whitebirk employment site in Hyndburn east of Blackburn at junction 6 of the M65 and the 70 acre Burnley Bridge brownfield site in Burnley at junction 9 of the M65. This inititaitve is to be terminated in March 2011.

Bolton Council's emerging Core Strategy proposes significant development in the M61 corridor, including at the Horwich Loco Works strategic economic opportunity site, relatively close to the boundary with Chorley. A mixed use development is proposed for this site for employment and housing.

As well as this there are important transportation and Green Infrastructure links between Central Lancashire and Blackpool, and their neighbours. For example the Leeds-Liverpool Canal to Blackburn and Wigan, through the Ribble Coast and Wetlands Regional Park to West Lancashire and Fylde.

The main cross-border implications for the water cycle within the area are:

- Competing demand for water resources particularly from expansion in Bolton and Pennine Lancashire. However we have assessed water resources in Chapter 6 and concluded that there are no water resources issues.
- Growing demand upon sewage treatment resources within the area and the region.
- Future pollution pressures upon watercourses rising upstream of the area boundary that pass through the area.

3 Background information and methodology

3.1 Introduction

This chapter of the report outlines background information and the methodology adopted for each of the technical elements of the WCS.

3.2 Flood risk

3.2.1 Background

A review of flood risk management options during the early phases of a water cycle study is essential to ensure that:

- The risk of flooding from all sources to the development areas is considered and development is steered away from high risk areas (in particular, Flood Risk Zones 2 and 3).
- The potential impact of development proposals on catchment flood response is considered.
- Any flood risk mitigation measures are planned in a strategic, rather than unplanned fashion.
- There is no deterioration to existing communities' standard of protection.

The Water Cycle Study Guidance (Environment Agency, 2009) states that the output of the Outline water cycle study should answer the following question:

"Is there enough land available for development – without increasing flood risk or building vulnerable properties in flood risk areas?"

The water cycle study is not intended to replace site-specific flood risk assessments by developers. Instead, it identifies the potential for developers, local planning authorities and the Environment Agency to work together in providing strategic solutions that benefit the catchment as a whole.

The aims and scope of this flood risk and surface water assessment are therefore as follows:

- to review the findings of recent studies of flood risk in the areas of Blackpool Borough Council, Chorley Borough Council, Preston City Council and South Ribble Borough Council.
- to determine existing flood risk to the proposed development areas from all sources of flooding, in order to aid the local planning authority in selecting preferred areas;
- to identify the potential for strategic solutions to mitigate the effects of development and improve flood risk protection standards in the study area; and

- to identify if there are data or knowledge gaps that require a phase 2 detailed water cycle study.

3.2.2 Methodology

A number of studies have been undertaken within the study area assessing flood risk and providing flood risk policies. Studies on flood risk management in the relevant catchments are listed below. These have been reviewed as part of the work carried out for this water cycle study. The documents available for review include:

- North West Regional Flood Risk Appraisal (RFRA) (October 2008)
- Final Level 1 Strategic Flood Risk Assessments (SFRAs) for Central Lancashire (December 2007) and for the Borough of Blackpool (December 2009)
- River Ribble Final Main Stage Catchment Flood Management Plan (CFMP) Report (January 2009);
- River Douglas Final Main Stage Catchment Flood Management Plan (CFMP) Report (December 2009);
- River Wyre Catchment Flood Management Plan (CFMP) Report (December 2009);
- Planning Policy Statement 25: Development and Flood Risk
- North West England and North Wales Shoreline Management Plan SMP2 Consultation Draft (October 2009)

For potential strategic allocations (or potential preferred sites) in the study area, the hydrological analysis considered the existing flood risk to the development through an analysis of the Environment Agency's Flood Zone 2 and 3 maps and other sources of flood risk. The combined area of Flood Zones 2 and 3 within each proposed site allocation was estimated to determine the level of fluvial flood risk. For each potential site allocation, an assessment was then undertaken to determine whether there is sufficient land at low flood risk (for the purposes of this study low flood risk is classified as land within Flood Zone 1) to accommodate the proposed housing allocation. The assumption was made that housing density would be 40 properties per hectare with 15% of the site being open space. The SFRA was used to identify flooding from other sources at the strategic locations.

A high level review of the Environment Agency's Flood Zone maps has been undertaken in relation to each settlement and its surrounding area to identify any major constraints to development. The Level 1 SFRA data has also been used to identify flood risk from other sources including surface water, groundwater and impounded water bodies (e.g. canals and reservoirs).

3.3 Surface water drainage

The surface water drainage assessment for the Central Lancashire and Blackpool WCS has been carried out to:

- identify the types of Sustainable Drainage Systems (SUDS) which may be applicable for the proposed development locations;

- make policy recommendations about the use of sustainable surface water drainage techniques across the study area, and;

- identify the indicative maximum runoff rates and volumes to be acheived from major strategic allocations to ensure that runoff rate and volume from the development site does not exceed greenfield runoff rates and volumes up to the 1 in 100 year rainfall event, plus an allowance for climate change.

3.3.1 Background

The effect of development is generally to reduce the permeability of a site. The consequence of this, if no measures are put in place, is to increase the volume of water and the peak flow rate from the developed site during and after a rainfall event. Increases in the volume of water and the peak flow rate can cause flooding to occur both within a development site, and can increase flood risk downstream of the development.

The ethos of sustainable surface water drainage is to mimic, as far as possible, the surface water flows (volume and peak flow rate) from the site prior to development. This can be achieved through drainage infrastructure which can reduce the volume of water and peak flow rate from the development site; this drainage infrastructure has become commonly known as Sustainable Drainage Systems (SUDS). SUDS are used to reduce the peak flow rate and volume of water from a development site, and SUDS techniques can be used to improve the quality of surface water runoff and provide amenity and biodiversity benefits.

A SUDS management train should be adopted to manage surface water drainage sustainably and to mimic natural catchment processes as closely as possible. As a general rule, surface water should be managed as close to source as is practicable. The SUDS management train, illustrated in Figure 3-1 has four principle components (Source: SUDS manual C697, CIRIA 2007):

- **Prevention** - The use of good site design and site housekeeping measures to prevent runoff and pollution (e.g. sweeping to remove surface dust and detritus from car parks), and rainwater harvesting. Prevention policies should generally be included within the site management plan.

- **Source control** - Control of runoff at or very near its source (e.g. soakaways, other infiltration methods, green roofs, pervious pavements).

- **Site control** - Management of water in a local area or site (e.g. routing water from building roofs and car parks to a large soakaway, infiltration or detention basin).

- **Regional control** - Management of runoff from a site or several sites, typically in balancing ponds or wetland.

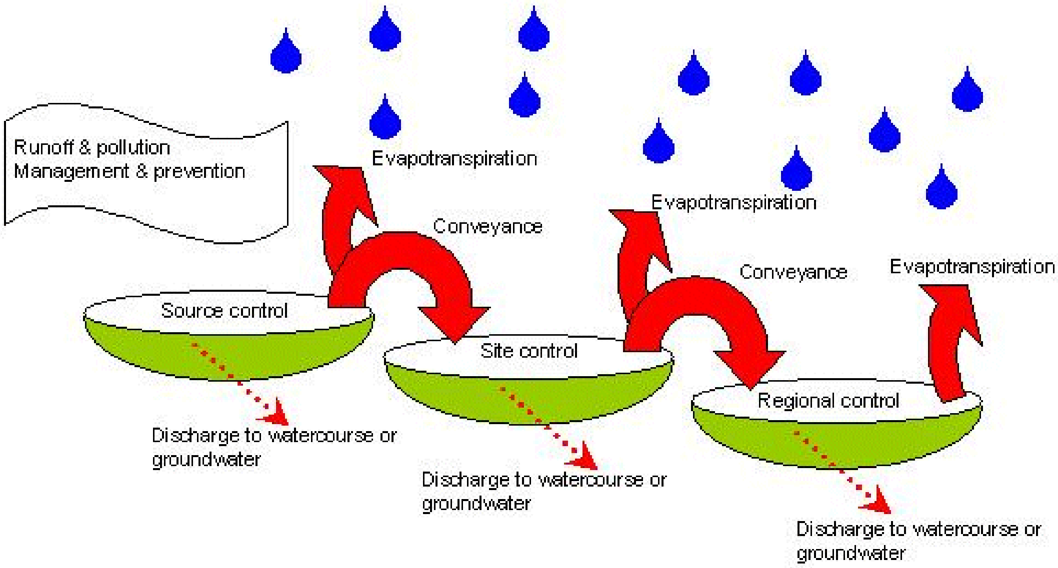


Figure 3-1 SUDS management train (http://www.ciria.com/suds/suds_management_train.htm)

Different sustainable drainage techniques will be applicable at different scales and for performing different functions. For small developments or extensions to the curtilages of existing properties, source control approaches will be more applicable and should be adopted to mitigate surface water runoff rate and volume. Evidence from the Integrated Urban Drainage pilot studies indicated that extensions to existing properties (also known as 'urban creep') can increase surface water flood damages as significantly as climate change. It is therefore critical to manage additional surface water runoff from urban creep. It is particularly challenging to manage urban creep effectively; this is often due to the lack of available space in high density urban areas to attenuate or infiltrate surface water runoff. The techniques which might work to reduce surface water runoff from 'urban creep' include:

- soakaways;
- pervious pavements, and;
- rainwater harvesting or water butts (which perform a limited function to reduce runoff).

In general, the policy to deal with urban creep should seek to reduce runoff, where possible using sustainable drainage techniques. Any additional surface water which is discharged to watercourse should be discussed with the Environment Agency. United Utilities have stated that no surface water should be discharge to sewers.

In larger development sites, the SUDS management train will be more applicable, and a series of source, site and regional drainage structures will be more applicable. Even in larger developments, source control measures should be encouraged and adopted before measures further down the train are adopted.

Sustainable surface water drainage should be adopted for all new developments (including redevelopment of brownfield land). Surface water runoff volume and peak flow rate from the development sites should not exceed greenfield runoff rate and volume up to and including the 100 year, 6 hour rainfall event (including an allowance for climate change). In brownfield developments, it may not be possible to achieve greenfield runoff rate and volume, but a reduction in surface water runoff should be achieved after the redevelopment and developers should agree the surface water drainage requirements with the local authority (Preston City Council, Chorley Borough Council, South Ribble Borough Council or Blackpool Borough Council, as appropriate) and the Environment Agency early on in the development application process.

The Floods and Water Management Act became law on April 2010 and has brought about significant legislative changes to the management of surface water. A summary of the key clauses in the Act related to sustainable drainage is outlined.

- Upper tier and unitary authorities will become responsible for the adoption and maintenance of new build SUDS; new build includes all new development and redevelopment, although SUDS draining only single properties or publically-maintained roads are excluded..

- Upper tier and unitary authorities will act as the approving body for all new build SUDS. Developers may not begin construction until the drainage system is approved. The requirements for approving new build SUDS will be outlined in forthcoming national standards on the construction and operation of surface water drainage.

- The automatic 'right to connect' surface water drainage to the public sewerage network has been removed. New surface water drainage systems will need to be approved in line with the National Standards before any connection to the public sewerage network is made.

- Before determining approval, the SUDS approving body is required to consult with the Environment Agency, British Waterways, or relevant internal drainage board, sewerage undertaker or highway authority if the SUDS discharges directly or indirectly into their watercourse or sewer system.

Where possible, runoff should be infiltrated to the ground, since this has the advantage of retaining runoff near to source in the closest imitation of greenfield behaviour, which serves to replenish groundwater and avoid flood risk from surface runoff. Where infiltration is not possible, due to factors such as low permeability soil, a high water table or risk of mobilising pollution, surface water should be discharged to a nearby watercourse or, in the last resort, public sewer system. In both cases, SUDS are required to attenuate the runoff so that it is discharged in a controlled manner which does not increase flood risk.

There are known pressures on the wastewater system in the study area; these are outlined in Sections 3.5.1 and Chapter 7. There is evidence of limited foul and combined network capacity. Therefore all new development should keep surface water out of the foul/combined system. Any redevelopment or brownfield development must reduce the amount of surface water draining into foul/combined networks.

Examples of infiltration SUDS are devices such as soakaways, infiltration trenches, infiltration basins and pervious pavements (Figure 3-2). SUDS devices typically used for attenuation are detention basins, ponds and wetlands (Figure 3-3). In some cases the attenuation devices are lined in order to prevent infiltration altogether (e.g. where mobilisation of pollution is an issue or high groundwater levels pose a risk of flooding) but in other cases they may also permit some limited infiltration. Illustrations of SUDS examples can also be found in the CIRIA SUDS website at the following link: http://www.ciria.com/suds/

(a) Infiltration trench alongside a road – no kerbs or gullies needed to be incorporated in the design

b) Swales and basins can be incorporated as landscaped features where they would be looked after as part of the normal maintenance contract. Swales may conduct water to other features whilst also providing some infiltration.

(c) Pervious pavement reduces the risk of surface runoff flooding without compromising on the car park's utility

Figure 3-2 Examples of infiltration SUDS (reproduced from "Sustainable Drainage Systems: an Introduction" by the Environment Agency)

(a) Detention basin fitted in the centre of a motorway roundabout

(b) Ponds and wetlands are typically fitted as the final stage of a SUDS system for a major development

(c)Roof water is directed into this storage pond which serves as an attractive feature of Wheatley Services Area on the M40

Figure 3-3 Examples of infiltration SUDS (reproduced from "Sustainable Drainage Systems: an Introduction" by the Environment Agency)

3.3.2 Methodology

The data and information used for this section of the outline WCS is outlined below:

- Environment Agency Aquifer maps (available online at http://www.environment-agency.gov.uk/homeandleisure/117020.aspx);

- Environment Agency Source Protection Zones (GIS);

- British Geological Survey drift and bedrock geology (available online at http://www.bgs.ac.uk/data/services/digmap50wms.html);

- Nitrate Vulnerable Zones (GIS). NVZs were set up under Council Directive 91/676/EEC and have been established in areas where nitrate from agricultural land is causing pollution of the water environment.;

- Defra/EA Preliminary Rainfall Runoff Management for New Developments, R&D Technical Report W5-074/A/TR/1

The surface water drainage assessment for the WCS has identified the appropriateness of SUDS for each potential development location in relation to the underlying geology, soil type and groundwater classification. It is the developer's responsibility to undertake the analysis required to provide the evidence base to prove that flood risk will not be exacerbated as a result of the development. This should be included within the planning application.

For potential major development locations a detailed assessment of drainage and SUDS requirements has been carried out. Approximate storage volumes and allowable runoff rates have been calculated for major development sites greater than 500 houses. The calculation method is outlined in the joint Defra / Environment Agency R&D technical Report "Preliminary rainfall runoff management for developments" (Environment Agency 2007). This method provides initial, conservative estimates of the increase in peak flow and volume of runoff from proposed developments[2].

For each site the outputs provide indicative runoff rates and volumes to match existing greenfield runoff rates and volumes, and include:

- maximum runoff rate (l/s) required for 100 year event to manage runoff rate to existing rate – this is the rate of discharge required from the developed site to ensure that runoff rate is no greater than greenfield runoff rate;

[2] Assumed that 15% of land is left as open space; 50% of land is developed (i.e. made impermeable) for purely residential, 75% of land is developed for mixed use, and 100% is developed for purely commercial development.

- maximum long term storage discharge rate required – discharge from the attenuation storage is allowed to be discharged at 2 l/s/ha;

- total estimated storage required – the sum of the attenuation volume and attenuation storage (or long term storage), to ensure that both runoff rate and volume match the existing rate and volume;

- total maximum discharge rate from the developed site – the sum of the maximum runoff rate from the attenuation storage and the discharge from long term storage at 2 l/s/ha.

The percentage of total site area which will be taken up by storage, assuming no infiltration occurs, has been calculated to assess whether there is sufficient developable land in light of the surface water drainage storage requirements.

For non-strategic sites it is not possible to undertake a definitive assessment of surface water management and SUDS requirements. The assessment can be used to indicate where sustainable surface water management will be more readily achievable based on underlying geology, soil type and groundwater classification.

3.4 Water resources

3.4.1 Background – statutory water resources planning

The public water supply to the study area is provided by United Utilities (UU). UU supplies water to around 2.9 million households and around 200,000 businesses. 80% of water is supplied from surface water sources which comprises of 89 water supply reservoirs, 36 river and stream intakes and 5 lake abstractions. The remaining water is supplied from 79 groups of groundwater sources such as boreholes, adits, springs and mines.

UU supplies water to four discrete Water Resource Zones (WRZ) covering North West England. Our study area lies within the Integrated WRZ which serves 95% of the population (6,535,000) covered by UU and covers the areas of south Cumbria, Lancashire, Greater Manchester, Merseyside and most of Cheshire. The supply network within the Integrated Zone has a high degree of inter-connection. The other three zones are relatively small, and are remote from the regional network.

The majority of water is supplied from upland reservoirs and lowland rivers and supported by groundwater sources and upland streams. The total water yield (known as water available for use (WAFU)) in 2007/08 is 2013Ml/d[3] for the whole UU region. In total over 200 sources supply 1900Ml/d in a normal year to the whole region. Of this 1800Ml/day is supplied in a normal year to the Integrated WRZ; 500ML/d of this is from sources in Wales, 600Ml/d from Cumbria and the rest from other sources in the North West. Table 3-1 shows water source yields for the Integrated WRZ.

[3] Ml/d = million litres per day

Water Source Yield at 2006/07	Water Source Yield at 2007/08	Benefit of West-East link from 2012/13	Impact of sustainability reductions from 2014/15	Impact of climate change at 2034/35	Water Source Yield at 2034/35
1931.7	1908.0	+16.6	-32.9	-28.1	1863.6

Table 3-1: Water source yields (Ml/d) for the Integrated WRZ.

Water is treated at 107 primary water treatment works. The UU supply system is centred on major aqueducts which link the Lake District to South Cumbria, Lancashire and Greater Manchester and link mid-Wales and the River Dee to Cheshire and Merseyside. UU have invested in a new bi-directional pipeline which will be operational from 2011. This new West-to-East link will allow the transfer of water in summer from Cheshire and Merseyside to Manchester to replace the reductions in source yield from the Lake District and the Pennines which will occur as part of the sustainability reductions. The new pipeline will also aid asset inspections of trunk mains.

The Integrated WRZ also includes a raw water supply from the River Dee to Welsh Water and a non-potable supply of raw water form the River Dee to some UU industrial customers in the Wirral. In 2006/07 this amounted to 70Ml/day. There is also a small amount of non-potable water supplied to industrial customers in Warrington. These supplies are not part of the potable water supply system and thus are not considered further by UU in their WRMP. There is also a very small bulk import from the Dee Valley Water Company of less than 0.1Ml/day and a few very small bulk supply exports to Dee Valley Water Company and Severn Trent Water Company totalling 0.01Ml/d.

We have assumed that the status quo will be maintained and that UU will remain responsible for the provision of water resources for the development areas within the study area. Other companies may supply water to development sites via Inset Appointments[4], but this has not been included as part of the WCS assessment. UU have stated in their WRMP that they have been approached for an inset appointment but this has not yet come to fruition and is for a very small area.

Environment Agency Water Resource Management

The Environment Agency manages water resources at a local level through Catchment Abstraction Management Strategies (CAMS), which are prepared on a 6 yearly cycle.

Within the CAMS, the Environment Agency's assessment of the availability of water resources is based on a classification system which states the perceived resource availability status, indicating:

[4] The inset appointment process is the route by which one company replaces the incumbent as the appointed water and/or sewerage company for a specified area. As such the replacement appointed water company will have all of the same duties and responsibilities as the previous statutory water company for the specified area. More information is available at http://www.ofwat.gov.uk/legacy/aptrix/ofwat/publish.nsf/content/insetappointments1205.html

- the relative balance between the environmental requirements for water and how much is licensed for abstraction;
- whether water is available for further abstraction, and;
- areas where abstraction needs to be reduced.

The categories of resource availability status are shown in Table 3-2. The classification is based on an assessment of a river system's ecological sensitivity to abstraction-related flow reduction.

Indicative Resource Availability Status	Licence Availability
Water available	Water is likely to be available at all flows including low flows. Restrictions may apply.
No water available	No water is available for further licensing at low flows. Water may be available at high flows with appropriate restrictions.
Over-licensed	Current actual abstraction is such that no water is available at low flows. If existing licences were used to their full allocation they could cause unacceptable environmental damage at low flows. Water may be available at high flows with appropriate restrictions.
Over-abstracted	Existing abstraction is causing unacceptable damage to the environment at low flows. Water may still be available at high flows with appropriate restrictions.

Table 3-2 CAMS Resource Availability Status Categories

This classification can be used to help assess the potential for additional water resource abstraction opportunities.

UU's Integrated WRZ covers most of the North West area which is covered by the following CAMS:

- Douglas CAMS, EA, 2003 (covers Chorley, Leyland, Wigan, Horwich, Skelmersdale and Ormskirk).
- Northern Manchester, EA, 2007 (covers Rawtenstall, Rochdale and Bolton).
- Wyre CAMS, EA, 2006 (covers Blackpool, St Michael's on Wyre and Cockerham and Abbetstead).
- Ribble CAMS, EA (covers Preston).
- Eden and Esk, EA, 2006 (covers Penrith and Kirkby Stephen, also covers other areas outside of the Integrated WRZ).
- Kent CAMS, EA, 2004 (covers Kendal, Staveley and Carnforth).
- Leven and Crake CAMS, EA, 2003 (covers Ambleside, Ulverston and Grange over Sands).
- Lower Mersey and Alt CAMS, EA, 2008 (covers Liverpool, Birkenhead, Runcorn, Widnes, Warrington, St Helens and Manchester).
- Lune CAMS, EA, 2004 (covers Lancaster, Kirkby Lonsdale and Sedburgh).

- Mersey and Bollin, EA, 2005 (covers Manchester, Stockport, Knutsford and Macclesfield).
- Tame, Goyt & Etherow CAMS, EA, 2004 (covers the area to the south-east of Manchester).
- Weaver and Dane CAMS, EA, 2006 (covers Crewe and Northwich).

The Blackpool and Central Lancashire study areas lies within the Northern Manchester CAMS, the Douglas CAMS, the Ribble CAMS and the Wyre CAMS. However given the inter-connectivity within the Integrated WRZ, which covers such a large geographical area, water abstracted from any part of the network can be moved to any other part within the zone, therefore restrictions upon abstractions could impact upon the whole WRZ. However it is most likely that water abstracted will be used locally to minimise the costs and efforts in transporting it and therefore the table below summaries the water availability for the CAMS which cover the study area directly.

Table 3-3 identifies the status of each Management Unit (MU) in each CAMS covering the study area (where available). Due to the wide geographical area it could be that restrictions in other Management Units in other CAMS could impact upon the availability of water resources in the Integrated WRZ as a whole.

The CAMS and the CAMS units identified in Table 3.3 show that there are still areas where water is available for abstraction; however there are many areas where water is not available. This leaves no water available for further licensing at low flows and places restrictions on abstraction during high flows. There are also several areas which are currently over licensed or over abstracted. The Wyre CAMS identifies that the over-abstracted management units (surface water MUs 3 and 5) are due to abstraction for Public Water Supply (PWS).

The flexible nature of the Strategic Water Grid and its import/export capability between surface water and groundwater abstraction catchments show that water supply within the study area is not dependant on abstraction within the area, and is a product of the overall WRZs deployable output and supply links within it.

The Environment Agency has also assessed the relative water stress of areas throughout England as shown in Figure 3-4. The classification is based upon current per capita demand for water, forecast growth in per capita demand for water, forecast population growth, current water resource availability and forecast resource availability. Based upon these factors the area supplied by UU is classified as an area of low water stress.

CAMS	Percentage of water abstracted for Public Water Supply (PWS)	Management Units where water is available	Management Units where No water is available	Management Units that are over-licensed	Management Units that are over-abstracted.
Douglas	79	1 and 2 (surface water) 5 and 6 (groundwater)	3 and 4 (surface water) 7 (groundwater)	None	8 (groundwater)
Northern Manchester	Not provided	1, 2 and 4 (surface water) 1 (groundwater)	3 and 5 (surface water)	2 (groundwater)	None
Wyre	Not provided	4 (surface water)	2 (surface water)	1 and 6 (surface water) 1 and 2 (groundwater)	3 and 5 (surface water)
Ribble	CAMS not available				

Table 3-3: Summary of water availability in CAMS within the WCS area. Water Resource Management Units are as referenced in the CAMS documents.

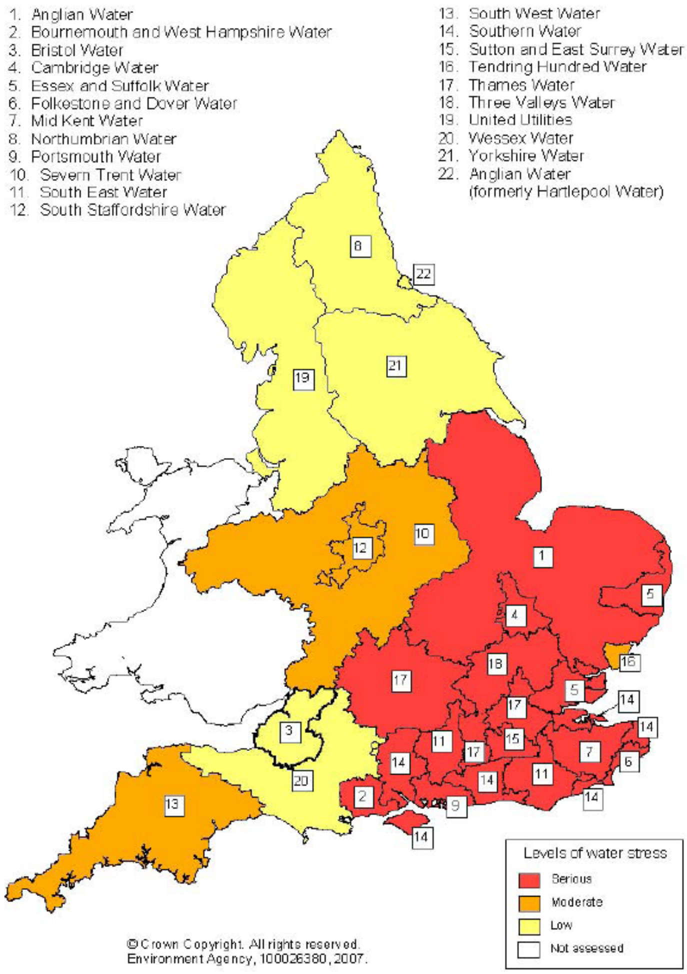


Figure 3-4: Map of Areas of Relative Water Stress (source: Areas of Water Stress, Final Classification; Environment Agency)

Water Company Planning

As the appointed water company, UU has a responsibility to provide sufficient quantity and quality of water to meet the needs of its customers, whilst also minimising their impacts on the environment. This responsibility also applies to new customers and population growth, as well as changing demands within the existing customer base and so must be comprehensively planned for.

All water companies have a duty to produce water resources management plans (WRMP) covering the next 25 years. These plans set out how companies intend to provide sufficient water to meet their customers' needs. Although not previously compulsory, companies have prepared 25 year water resource management plans on a voluntary basis, and shared these with the Government and regulators, since 1999. On 1 April 2007 these plans became compulsory under changes to the Water Industry Act 1991, and are now also subject to public consultation before they are finalised. Information regarding the strategic water resources for the study area has been obtained from UU's Final Water Resources Management Plan September 2009 (WRMP09). This uses data from 2006/07 as the baseline and forecasts supply and demand up to 2034/35.

Whilst strategic plans for meeting future demand over a 25 year period are set out in the WRMP, the detailed design of schemes is not undertaken until works have been granted funding by Ofwat. Any improvements to the water services infrastructure needs to be programmed into a water company's capital programme, which runs in five year Asset Management Plan (AMP) cycles. We are currently in the AMP5 period (2010 – 2015) and water companies have received the final determination of their business plan by Ofwat, which determines its allowable capital expenditure for AMP5 (2010-2015). This funding cycle and its associated constraints can have implications for the phasing of development, and it is important that water companies are involved in the planning process to ensure that infrastructure can be provided in time.

3.4.2 Background –national, regional and local policies on demand management National Policy

The Government's new water strategy for England, *Future Water* was published February 2008. *Future Water* outlines a strategic and integrated approach to the sustainable management of our water resources to 2030, for the public water supply as well as for the provision of healthy ecosystems and the services they provide.

The Vision by 2030 includes the following measures:

- Reduced per capita consumption (pcc) of water through cost effective measures, to an average of 130 litres per person per day (l/p/d) by 2030 or possibly even 120 litres per person per day depending on new technological developments and innovation (the current pcc based on an average of measured and unmeasured households in the Integrated WRZ is 140 l/h/d);
- Amend the Building Regulations to include a requirement for a minimum standard of water efficiency in new homes. The requirement will be in the form of a calculated whole building performance standard set at 125 litres per day (l/p/d).
- In areas of serious water stress it is believed that near universal metering will be needed by 2030.

In response to the Strategy the Environment Agency has stated that in water stressed areas the introduction of universal metering needs to be undertaken earlier. The Environment Agency would like to see the majority of households in areas where water is scarce to be metered by 2015 with the remainder in water scarce areas being metered by 2020. The Environment Agency also wishes to promote the metering of all new properties, including flats.

Code for Sustainable Homes (CSH)

The Code for Sustainable Homes introduces a step-change in sustainable development and forms a basis for future developments to the Building Regulations. As of May, 2008 the Government has made it mandatory that all new homes have a rating against the Code for Sustainable Homes. The Code measures the sustainability of a new home against nine categories of sustainable design, rating the 'whole home' as a complete package. The Code uses a 1 to 6 star rating system to communicate the overall sustainability performance of a new home. The Code sets minimum standards for energy and water use at each level.

The relevant sections in relation to the water cycle study are:

- Water Efficiency;

- Surface Water Run-off; and
- Energy / CO_2 (relating to heating water).

A minimum requirement for each of the nine categories is necessary to achieve the base rating of Level 1. Beyond this, threshold values must be attained for both 'Water' and 'Energy' to achieve higher code levels. Hence to achieve for example Code Level 3, the requirements for both carbon and water efficiency must be achieved in addition to the minimum points system requirement. Points may be awarded in the other sustainability categories for initiatives and measures implemented beyond the base level requirement for Code Level 1. It should be noted that to attain Code Level 3, a home must satisfy the criteria for carbon AND water efficiency. The reduction in use of heated water can therefore contribute towards achieving higher targets for both carbon and water efficiency.

Table 3-4 defines the Carbon and Water Efficiency requirements for each Code Level rating. This assumes the basic entry requirements are met for the other six categories.

Achieving a sustainability rating

	Minimum Standards				
	Energy		Water		
Code Level	Standard (Percentage better than Part L[1] 2006)	Points Awarded	Standard (litres per person per day)	Points Awarded	Other Points[4] Required
1(★)	10	1.2	120	1.5	33.3
2(★★)	18	3.5	120	1.5	43.0
3(★★★)	25	5.8	105	4.5	46.7
4(★★★★)	44	9.4	105	4.5	54.1
5(★★★★★)	100[2]	16.4	80	7.5	60.1
6(★★★★★★)	A zero carbon home[3]	17.6	80	7.5	64.9

Notes
1. Building Regulations: Approved Document L (2006) – 'Conservation of Fuel and Power.'
2. Zero emissions in relation to Building Regulations issues (i.e. zero emissions from heating, hot water, ventilation and lighting).
3. A completely zero carbon home (i.e. zero net emissions of carbon dioxide (CO_2) from all energy use in the home).
4. All points in this document are rounded to one decimal place.

Table 3-4: Code Level requirements for energy and water efficiency

(Source: Code for Sustainable Homes – A Step Change in Sustainable Home Building Practice. Crown Copyright, 2006.)

Current building regulations require new properties to be water efficient to some extent (125l/h/d) and all new social housing already has to be built to CSH level 2 (120 l/h/d). The Government's Building a Greener Future

- Policy Statement (CLG, 2007) sets a target for all homes to be zero carbon by 2016 (CSH Level 6), aided by progressive tightening of Building Regulations. Although the assessment of homes for CSH is mandatory, the attainment of any set level is not mandatory and there remains uncertainty about how and when building regulations will be tightened to ensure CSH6 by 2016.

The Water Act 2003 places a requirement on LPAs to take steps wherever practicable to encourage the conservation of water.

The Environment Agency recommends that measures are adopted to allow the efficient use of water in all new homes with water efficiency set at 105 litres per head per day (i.e. level 3/4 for water within Code for Sustainable Homes) or better.

Regional and Local Policy

As of May 2010, the North West RSS set the overall policy context for the Region. This report refers to policies and housing targets/requirements that were identified in the NW RSS. In July 2010, the Secretary of State for Communities and Local Government revoked all Regional Spatial Strategies (RSS), including the NW RSS. The RSSs were was revoked under s79(6) of the Local Democracy Economic Development and Construction Act 2009 and no longer form part of the development plan for the purposes of s38(6) of the Planning and Compulsory Purchase Act 2004. On November 10th 2010 a judicial review found that the Coalition Government acted unlawfully in revoking regional plans without having primary policy in place, therefore the RSS still stands and will be in place until such a time that the revocation of it can be seen as lawful. Notwithstanding this, it is still a policy of the new Government to abolish regional planning in the long term, and the government intends to achieve this through the Decentralisation and Localism Bill, which has been laid before Parliament in December 2010.

The Central Lancashire Publication Core Strategy is proposing a 20 % lower housing target than that required by the RSS for at least the next two years, in other words:

Local Authority	RSS Hosuing target	80% of RSS housing target
Preston	507	406
South Ribble	417	334
Chorley	417	334

Table 3-5: Revised Hosuing targets in Central Lancashire. For explanation see paragraphs 8.10 to 8.13 of the Publication Core Strategy.

Under the Water Act 2003, (part 3 sections 81 & 83), relevant authorities must, where appropriate, take steps to encourage the conservation of water. The study area is covered by Blackpool LDF and the Central Lancashire LDF (produced jointly by Chorley, South Ribble and Preston local authorities).

The previous policies in the RSS relating to water efficiency included Policy EM5 (Integrated Water Management) which identified that for new developments water conservation and efficiency measures should be incorporated to the highest contemporary standard. Policy L4 (Regional Housing Provision) aims for new homes to be built to the Code for Sustainable Homes and to ensure that new dwellings will be served by adequate water supply. These RSS policies in some form or another should be carried forward into the LDFs.

3.4.3 Methodology

The assessment of water resources is not intended to replace the work already undertaken as part of UU's statutory planning carried out for the WRMP. For the WCS a review has been undertaken of the WRMP which provides an indication of the current and planned water available based on evidence from both UU and the Environment Agency. Policies which can be adopted by the local planning authorities to reduce water demand from the new and existing housing stock have been assessed and included in the report.

3.5 Wastewater infrastructure

3.5.1 Background

The wastewater that we produce from our homes and our businesses is collected by the drainage system below ground from where it is transported by gravity or via pumping to wastewater treatment works. This drainage system is known as the sewerage system, and can be either a separate or combined sewerage system.

A separate system comprises a foul system which conveys wastewater or foul drainage only to the wastewater treatment works, and a surface water system that collects roof and highway runoff and discharges the clean runoff into rivers and coastal waters. Combined systems collect both rainfall runoff and foul water, and in times of very heavy rainfall can be at risk of being overwhelmed and causing dilute sewage to flood above ground. Where this is the case, the combined system will have what is known as a combined sewer overflow (CSO).

A CSO acts as a relief valve during times of very heavy rainfall and allows dilute storm sewage to be discharged into river and coastal waters. The design of such overflows ensures that discharges only occur during times of very heavy rainfall when there is sufficient dilution in the receiving water to ensure the discharge does not cause pollution or environmental damage.

New developments that connect to the existing sewerage system can cause an increase in foul flooding and surface water flooding, and an increase in discharges from combined sewer overflows in combined sewerage systems, therefore it is important to understand the nature and capacity of the downstream sewerage system when allocating land for development.

Incapacity in the sewerage system is unlikely to be an absolute showstopper to development; where there is incapacity, upgrades to the existing sewerage system or new strategic sewer mains can provide additional capacity, subject to funding being provided. However, the time required to plan, finance and deliver sewerage upgrades depends on the length of upgrade required, and the land use below which the existing or new system would drain. Major upgrades through the existing urban area can cause significant disruption within the existing urban area and hence take longer to plan and deliver than new strategic systems through greenfield land. However, new strategic solutions can be significantly more costly.

United Utilities is responsible for the operation and maintenance of the existing foul drainage network and wastewater treatment facilities within the study area. Water companies have a legal obligation under Section 94 of the Water Industry Act 1991 to provide additional capacity as and when required. It is commonplace for a developer to use the power of requisition under section 98 of the Water Industry Act 1991 to require a sewerage undertaker to provide a new public sewer to serve its development. The sewerage undertaker has powers to deliver new sewers over third party land and the developer has to cover the whole cost of both providing the new infrastructure and upgrading the existing system to cope with the additional demands that will be placed upon it.

The urbanised areas within the Central Lancs and Blackpool areas are predominantly served by old, combined sewerage systems, and these were designed to accommodate the foul flow and limited surface water ingress from highways and roof drainage. Flows above this were discharged, untreated, to an adjacent watercourse via combined sewer overflows (CSOs), the relatively dilute nature of the combined sewage and the increased flow in the watercourse under storm conditions making this situation reasonably acceptable in environmental terms at the time. However, ongoing development on the periphery of urban areas has led to an increase in the volume, frequency and strength of discharges from CSOs, and, with increased environmental awareness this practice is now less acceptable, and has led to the Environment Agency placing "no deterioration" clauses on discharge consents for CSOs.

Any development upstream of a CSO (or even downstream in some instances) will result in an increase in flow and this will inevitably result in greater frequency and volume of discharge from the CSO. This would therefore, by definition cause deterioration and would consequently contravene the discharge consent. It is therefore essential that any planning consent for a development should stipulate a point of discharge into the sewerage network agreed with the sewerage undertaker, to ensure that the increased flow does not result in localised flooding, or result in the discharge from a CSO failing to meet the consent requirements. Discharge of surface water from the development into the combined sewerage system would clearly exacerbate this situation, and a separate sewerage system should therefore be provided for all new developments where practicable, with surface water discharging to a local watercourse via attenuation tanks.

Assessing the available headroom at any particular treatment works is problematical. This is because, typically, flows to the works vary with time, particularly in relation to changes in trade discharges. Thus, an exact evaluation of spare capacity at any particular works is not possible. In addition to this, the forthcoming introduction of the Water Framework Directive (WFD) may lead to a tightening of discharge consents.

Limited information on wastewater treatment works, network capacity and consented flow has been available to support the WCS, and this is recognised as a limitation on the findings of the study. However, it has been possible to identify where further, more detailed wastewater capacity assessments might be required. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure.

Any improvements to the treatment works will be programmed into the water companies' capital programme, which runs in five year Asset Management Plan (AMP) cycles (Figure 3-5). We are currently in the AMP5 period (2010-2015) and the water companies have prepared their draft business plans, to determine their regional capital expenditure for AMP5 (2010-2015). This funding cycle and its associated constraints may have implications for the phasing of development. Early consultation with water companies is required to support their capital expenditure programme for AMP6 and beyond. If required, investment which has not been included in the capital expenditure programme can occur (e.g. investment in AMP5 which has not been planned for), and the water companies can reclaim the expenditure as part of their AMP6 programme.

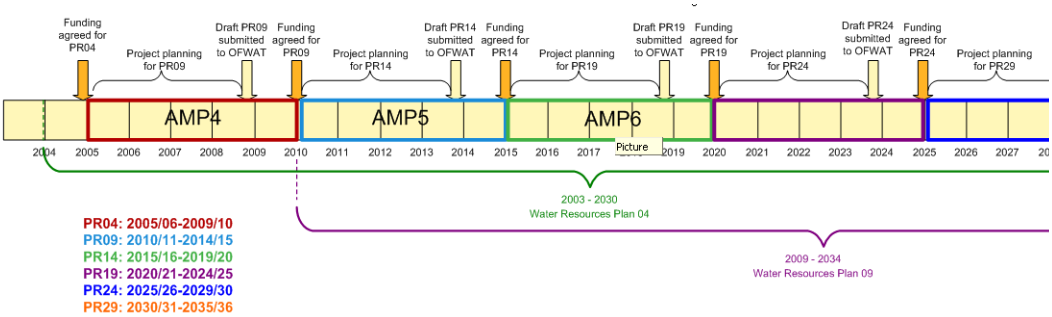


Figure 3-5: Water Company Capital Programme, AMP cycles

3.5.2 Methodology

The data and information used for this section of the outline WCS is outlined below:

- United Utilities wastewater treatment works catchment boundaries (supplied by UU);
- Proposed development locations supplied by the local planning authorities;
- Meetings with UU wastewater catchment managers.

The wastewater assessment for the WCS has identified whether the wastewater treatment works (WwTW) has the capacity to cope with the proposed development planned within its catchment area. Any other issues which may impact on development were also discussed with the UU catchment managers.

3.6 Water quality

3.6.1 Background

A review of water quality is required during the development process to ensure that development does not adversely affect water quality, and does not hinder the ability of a water body to meet the WFD.

Development can adversely affect water quality in two principal ways:

- increases in final effluent load from WwTW which causes a deterioration of water quality, and;
- increases in intermittent discharges from combined sewer overflows (CSOs), pumping stations, and storm tanks at WwTW – the potential for development to affect the operation of overflows has been assessed as part of the wastewater assessment.

The future expansion potential of a wastewater treatment works with respect to water quality is determined by assessing the discharge consent, set by the Environment Agency. This consent is based on the ecological sensitivity of the receiving watercourse and specifies a maximum flow and a minimum effluent quality that the WwTW has to achieve to meet water quality targets without causing environmental damage.

As the population connected to a sewage treatment works increases, the amount of treated wastewater (or effluent) being discharged to the receiving water generally increases in proportion to the population increase.

When this increased population causes the treatment works to exceed the current consented maximum discharge volume allowed by the Environment Agency consent, improvements are likely to be required to the treatment works to improve the standard of treatment and to ensure river quality does not deteriorate.

The quantity of treated effluent discharged from each treatment works and its quality is specified by the legal discharge consent, issued by the Environment Agency under the Water Resources Act 1992. The consent is normally based upon the dry weather flow (DWF) of the treated effluent, and stipulates limits for the concentration of biochemical oxygen demand (BOD), total suspended solids (TSS) and ammoniacal nitrogen (NH3). Compliance is determined by means of statistical analysis of effluent quality data. To this end the DWF and quality of discharge from a WwTW forms the "planned water quality"; that is the water quality the Environment Agency would expect if the WwTW was discharging at its DWF and discharge consent. The planned water quality has typically been based on the River Ecosystem Classification of a river reach.

In the foreseeable future, consent limits will be set with a view to meeting the requirements of the Water Framework Directive (WFD) whose aim is to ensure that good river quality standards are met throughout each waterbody. The intention is to set the discharge consent limits based upon the quality and volume of the receiving watercourse and the volume of wastewater effluent at the point of discharge. However, the means of applying these principles to an individual discharge when upstream quality is already unsatisfactory, or when upstream flow provides inadequate dilution to maintain "good" quality status using best available techniques (BAT) for treatment, is presently unclear.

3.6.2 Methodology

We have held meetings to discuss water quality, wastewater treatment works consents and wastewater network capacities with United Utilities. A comprehensive qualitative assessment of wastewater treatment capacities at key WwTWs and wastewater network capacities is provided in Chapter 7. An in depth analysis of wastewater treatment impacts on water quality is provided in Chapter 8. Based on the data and information available for the outline WCS, including the North West River Basin Management Plan, detailed meetings with United Utilities Wastewater Catchment Managers and the current WFD classification of the water bodies which WwTW discharge into (from the Environment Agency's 'What's in my backyard' website), we have identified the level of growth predicted to drain to each WwTW. The results from this assessment are presented in Table 8 1. Where a receiving waterbody does not currently meet good status (all but two of the water bodies assessed) it is likely that more stringent discharge consents will be needed to ensure good status is met. Any changes to the consent to meet the requirements of the WFD will be promoted through the National Environment Programme (NEP) and agreed and incorporated into United Utilities' five year business plans.

4 Assessment of flood risk

4.1 Overview

The purpose of this chapter in the report is to provide a regional context for flood risk. The subsequent chapters discuss the findings of the WCS and their implications for each local planning authority, but this chapter provides an over-arching summary for the study area. An overview of the methodology to assess flood risk is provided in chapter 4. The Red-Amber-Green assessment table for each local authority give details of flood risk for each potential development area.

4.2 Catchment Description

The study area contains three main river catchments: the River Ribble, River Douglas and the River Wyre. Environment Agency Flood Zones are shown in Figures 4-1 to 4-4 in Appendix A.

4.2.1 River Ribble Catchment

The upper reaches of the River Ribble drain the steep West Pennine Moors; however the majority of the catchment is flat low-lying river floodplain. The lower Ribble meanders over a wide floodplain in a south westerly direction and the tidal limit is to the east of Preston. On the outskirts of Preston the Ribble is joined from the south by the River Darwen. The major tributaries of the Ribble include the Hodder, Calder, and Darwen. The catchment contains extensive areas of rural land containing numerous villages, together with some major urban areas including Burnley, Blackburn, Preston, and South Blackpool. There are also areas of high quality agricultural land, where there is a history of agricultural drainage.

The geology of most of the Ribble catchment down to the Calder confluence is Carboniferous Limestone. This is classed as a minor aquifer and is important for local water supplies and the generation of baseflow to rivers. The Ribble from the Calder confluence to the M6 motorway is Carboniferous Millstone Grit (sandstone), which together with the overlying soils tend to generate rapid flow to watercourses. The lower Ribble from the M6 to the Preston estuary lies on top of Permo-Triassic Sandstones, which are classed as major aquifers (i.e. can support abstraction for water supply for the public). The low-lying coastal zone around Lytham St Annes consists of Triassic Mudstone (a non-aquifer).

There are Environment Agency maintained flood defences along the Ribble in Preston and the Darwen in Walton-le-Dale with a standard of protection of 70-75 years. There are coastal defences around Lytham St. Annes

4.2.2 River Douglas Catchment

The River Douglas and its major tributary the River Yarrow, rise on Rivington Moor. The upper catchment is characterised by the Rivington Reservoir complex which significantly alters the natural drainage patterns of the Douglas and Yarrow. These reservoirs are used for public water supply and play a strategic role in water supply across North West England. In the eastern part of the catchment the rivers are steeper, responding quickly to rainfall. In the west, the catchment is flatter and rivers respond more slowly to rainfall.

The area is made up of both urban and rural areas. The east of the catchment is dominated by the larger urban settlements of Wigan, Chorley (on the River Yarrow), Leyland and Skelmersdale.

Land drainage within the catchment has been significantly changed over time to allow intensively managed agricultural land and urban areas to be created. In many reaches the rivers have been heavily modified and raised flood defences have been used widely. The floodplain of the lower Douglas and Yarrow consists of high grade agricultural land where drainage is modified by pumping within a complex network of artificial channels. The lower reaches of the Douglas are influenced by the tide which controls discharge from a number of river tributaries of the lower Douglas with pumped or flap outfalls. The Douglas flows into the Ribble estuary approximately 8km downstream of Preston.

The Douglas catchment has benefited from engineering schemes put in place over the last 50 years or more. These include:

- The Bannister Brook Flood Alleviation Scheme completed in 1993 has reduced the flood risk for the town of Leyland.

- Flood Alleviation works in Whittle Le Woods and Lostock Hall.

There are flood alleviation studies planned or on-going in Croston, and on the Yarrow.

4.2.3 River Wyre Catchment

The River Wyre catchment area extends from the high moorland of the Forest of Bowland fells in the upper, eastern part of the catchment to the lower lying central area and flat plains of the Fylde peninsular found adjacent to the Wyre estuary. The upper tributaries of the Wyre are steep, resulting in a rapid runoff response following rainfall. The watercourses within the Lower Wyre catchment are at a low elevation and sometimes at or below sea level. Rainfall over these tributaries often has difficulty in draining away, leading to ponding of surface water, which is exacerbated by the urban nature of these catchments.

The majority of the Wyre catchment is rural; however the greatest concentration of properties is located in the west of the Wyre estuary and includes the northern part of the coastal resort of Blackpool, Fleetwood, and includes the towns of Poulton-le-Fylde, Thornton, and Cleveleys.

The Garstang and Catterall Flood Alleviation Basins in the Wyre catchment have reduced flood risk to downstream areas. These are outside of the current study area.

4.3 Flood risk and surface water in context

4.3.1 North West Regional Flood Risk Appraisal (October 2008)

A Regional Flood Risk Appraisal (RFRA) for the North West was completed in October 2008. The Regional Flood Risk Appraisal (RFRA) for the North West Regional Spatial Strategy (RSS) follows the guidance set out in Planning Policy Statement 25 –PPS25 (November 2006) and the attendant practice companion guide, Development and Flood Risk (June 2008).

The RFRA ranks local authorities in terms of their overall flood risk. The rankings take into account the proportion of properties in the Environment Agency's Flood Zones, properties protected by flood defences, housing provisions (2003-2021), potential future flood risk (calculated as area brownfield land required for development outside the flood zones). Blackpool, Chorley, Preston and South Ribble local authorities are all ranked as "medium" flood risk category.

Key recommendations of the RFRA relevant to the Central Lancashire and Blackpool Water Cycle Study area are outlined below:

- Local authorities should take account of the Catchment Flood Management Plans (CFMP) outputs for their area and integrate these into their SFRA process.

- Local authorities within the top third of the flood risk ranking exercise would appear to have high existing levels of flood risk, high levels of development pressure and a greater challenge finding low risk brownfield sites outside of the floodplain to accommodate necessary growth on. However a high position in the ranking table should not be taken as an acceptance that development in the floodplain is an inevitable result. It indicates that the challenge to manage flood risk will be greatest in these locations and that it is these authorities where, if anywhere, exceptions test situations may be more common. To a degree, some of these will be where climate change impacts are also expected to be the greatest. To properly address these challenges, it is essential for local planning authorities develop an early and a robust SFRA and a transparent sequential test process is undertaken.

- There will need to be a much stronger policy framework within LDF's requiring SUDS to ensure capacity is maximised in the surface water drainage network and to make it more robust in light of the challenges of climate change. Developments not incorporating SUDS should not be acceptable unless other material planning or technical considerations which prevent their use can be clearly identified as part of any planning application.

- Changes in river and sea levels due to climate change need to be accounted for in Strategic Flood Risk Assessments.

- Take opportunities to use the spatial planning system to reduce flood risk. In this regard, planning for development and regeneration should attempt to: increase flood storage and attenuation, particularly including it within wider green infrastructure; use careful site layout to reduce the number of properties within floodplain areas and widen river corridors; increasing the use of SUDS and disconnecting some roof drainage from the sewer network; and taking opportunities to reduce flood risk to critical infrastructure, either through relocation or increasing resilience/resistance to flooding.

4.3.2 Central Lancashire Level 1 SFRA, (December 2007)

A Level 1 Strategic Flood Risk Assessment (SFRA) for Central Lancashire has been produced covering Preston City, Chorley Borough and South Ribble Borough. The purpose of the SFRA is to provide information on current and future flood risk (taking into account climate change) from all sources to allow decision makers to allocate development and infrastructure in accordance with PPS25.

The SFRA has identified six main sources of flood risk: fluvial flooding, tidal flooding, sewer flooding, surface water flooding, groundwater flooding and flooding from artificial sources

In general, the fluvial and tidal flood risk across the study area is low. The SFRA Flood Zones show that there are significant areas in the west of the study area that are potentially at risk of flooding, which is due to the flat, wide floodplains in the west of these areas that are tidally affected. However, these areas are largely rural and the populations potentially at risk are therefore minimal. Locations within the study area that are particularly affected by flooding include Croston, Penwortham, Walton-le-Dale and southwest Preston.

Grimsargh, Walton-le-Dale and Euxton and their surrounding areas were shown to have been particularly affected by sewer flooding. Little or no records of groundwater flooding were found during the course of the study. However, there are major aquifers with more permeable superficial deposits overlying them within the study area. Following periods of sustained rainfall, there may be a potential for groundwater flooding to affect basements and underground car parking facilities in certain areas, particularly Preston and also in areas immediately south of Preston including parts of Walton-le-Dale, Penwortham and Bamber Bridge.

There are few recorded incidents of flooding from the canal network, however the risk of flooding still remains. There are few recorded incidents of flooding as a result of reservoirs, though the residual risk of breaching and overtopping remains, along with the risk associated with emergency discharges.

There is one formally maintained flood storage area in Central Lancashire, which is located adjacent to Savick Brook in Fulwood, upstream of where Savick Brook passes beneath the A6 (Garstang Road).

The following key recommendations from the Level 1 SFRA is outlined below:

- The broad-scale and settlement-level assessments show that, whilst flood risk exists in areas of Central Lancashire, it does not pose a widespread and significant issue for the allocation of development sites. Where potential development sites are at risk from flooding, the planning authority must determine their suitability based on the Sequential Test and vulnerability classifications presented in Tables D1 and D2 of PPS25.

- Wherever possible the LPA's should seek to direct development to low probability Flood Zones (Flood Zone 1). Where this is not possible, development should preferably be located in Flood Zone 2 and where this is not possible, sites in Flood Zone 3 can be considered.

- Dependent on the vulnerability of the proposed development (as classified in PPS25 – table D2), some development sites that are either wholly or partly situated in Flood Zone 2 or 3 may require the application of the Exception Test.

- Those development areas requiring application of the Exception Test will require further assessment in a Level 2 SFRA.

- A site specific Flood Risk Assessment (FRA) should be undertaken where:

    - Development sites located in Flood Zone 2 or 3;

    - Development sites in excess of 1 hectare located in Flood Zone 1. Since the risk of fluvial or tidal flooding is minimal such FRAs should focus on the management of surface water;

    - Development sites located in an area known to have experienced flooding problems from any flood source;

    - Development sites located within 8m (water environment) of any watercourse regardless of Flood Zone classification.

4.3.3 Blackpool Level 1 SFRA (December 2009)

The SFRA for Blackpool was originally published in June 2008, and updated in December 2009 to take into consideration alterations to the Environment Agency flood risk maps. The assessment is based on the flood risk map for Blackpool published in July 2009.

The whole of Blackpool Borough is relatively flat low-lying land, although most of it lies above the 1 in 1000 year tidal level. It is protected in the west from coastal erosion and tidal inundation from the Irish Sea by concrete coastal defences, inspections of which are undertaken on an annual basis.

Most of the area of Blackpool falls within Flood Zone 1 (low probability of flooding). The main area of land within Flood Zone 2 and 3 is already built up land near Anchorsholme. There is no land within Flood Zones 3b. The main causes of flooding throughout the Borough are from Sewer Network failure on public, private or surface water systems due to inadequate maintenance, or due to being overwhelmed by exceptional rainfall events. There are known issues at Anchorsholme and Marton Moss due to the inundation of the pubic sewerage system.

A Sequential Test is required to be undertaken for all the potential development sites in accordance with the guidance set out in PPS25 to assess their suitability for development. In addition, PPS25 requires more detailed Exception Tests to be undertaken where there are potentially more vulnerable development locations with large areas in flood zones 2 and 3.

The areas of undeveloped land considered within the SFRA with any potential for strategic levels of development within Blackpool are either in flood zone 1 (low probability) or within flood zone 2.

Potential redevelopment areas exist within zone 3a in the Central Area of Blackpool where the Exception Test may be needed to support the development of sites, depending on the class of proposed development in accordance with PPS25. Residential sites within the part of the Central Area in zone 3a should only be brought forward if developers can demonstrate that it meets the requirements of the Exception Test.

Any significant new redevelopment of brownfield site will need to be accompanied by a detailed FRA, and include a detailed assessment of the implications of a breach of any defences for the development and appropriate mitigation.

Blackpool has been identified as being at highest risk from surface water flooding, and will be required to develop a Surface Water Management Plan (SWMP).

4.3.4 Catchment Flood Management Plans (CFMPs)
Three CFMPs cover the study area: the River Ribble, River Douglas and River Wyre CFMPs. The settlements included in the WCS which are in the relevant CFMP areas are illustrated in Table 4-1.

Local Planning Authority	Settlement within River Ribble CFMP	Settlement within River Douglas CFMP	Settlement within River Wyre CFMP
Blackpool Borough Council	Southern part of Blackpool	None	Northern part of Blackpool
Chorley Borough Council	None	Chorley, Adlington, Whittle-le-Woods	None
Preston City Council	Preston	None	Woodplumpton
South Ribble Borough Council	Walton-le-Dale, Bamber Bridge	Leyland	None

Table 4-1 CFMPs and settlements assessed within WCS

River Ribble Catchment Flood Management Plan, Final Plan, (January 2009)

The River Ribble Catchment Flood Management Plan (CFMP) partially or wholly covers the local authority areas of Preston City Council, South Ribble Borough Council, Chorley Borough Council and the southern area of Blackpool Boroough Council. The CFMP is a high level document of strategic policies designed to plan for flood risk management in the catchment over the next 50-100 years.

The River Ribble CFMP area has been divided into 10 Policy Units, four of which cover the area within the Central Lancashire and Blackpool water cycle study area. The policy units within the Ribble CFMP are based on clearly defined areas within the catchment and are based on physical characteristics (including hydrology, ecology, geomorphology, land use etc) and current and future flood risk. Determination of policy units was also influenced by the wider objectives in the catchment. One preferred appropriate policy will be applied across the policy unit.

The four policy units within the Central Lancashire and Blackpool water cycle study are outlined in Table 4-2 along with the draft flood risk management policy selected for each unit.

Policy Unit	Policy Choice
Preston and Walton-le-Dale	Policy Option 5: Take further action to reduce flood risk.
Lower Ribble and Fylde Streams	Policy Option 4 - Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change).
Rural Calder and Darwen	Policy Option 3: Continue with existing or alternative actions to manage flood risk at the current level.
Blackpool and Lytham St. Annes	Policy Option 5: Take further action to reduce flood risk.

Table 4-2 CFMP flood management units in the Ribble CFMP

River Douglas Final Main Stage Report Catchment Flood Management Plan (CFMP) (December 2009)

The River Douglas Catchment Flood Management Plan (CFMP) predominantly covers the Boroughs of South Ribble and Chorley. The River Douglas CFMP considers flooding over an area covering the River Douglas catchment and all of its tributaries. The document gives an overview of flood risk in the River Douglas catchment and sets out a preferred plan for sustainable flood risk management over the next 50 - 100 years.

The River Douglas CFMP area has been divided into 10 Policy Units, eight of which cover the area within the Central Lancashire and Blackpool water cycle study area. The policy units within the Douglas CFMP are based on clearly defined areas within the catchment and are based on physical characteristics (including hydrology, ecology, geomorphology, land use etc) and current and future flood risk. Determination of policy units was also influenced by the wider objectives in the catchment. One preferred appropriate policy will be applied across the policy unit.

The eight policy units within the Central Lancashire and Blackpool water cycle study are outlined in Table 4-3 along with the draft flood risk management policy selected for each unit.

Policy Unit	Policy Choice
Appleby Bridge and Croston	Policy Option 5: Take further action to reduce flood risk.
Tidal River Douglas	Policy Option 6: Take action with others to store water to manage runoff in locations that provide overall flood risk reduction or environmental benefits, locally, or elsewhere in the catchment.
Fluvial Yarrow	Policy Option 6: Take action with others to store water to manage runoff in locations that provide overall flood risk reduction or environmental benefits, locally, or elsewhere in the catchment.
Leyland and Lostock to Whittle-le-Woods	Policy Option 4: Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change).
Tidal villages	Policy Option 4: Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change).
Rivington	Policy option 1: No active intervention (including flood warning and maintenance), continue to monitor and advise.
Fluvial River Douglas	Policy Option 4: Take further action to sustain the current level of flood risk into the future (responding to the potential increases in risk from urban development, land use change and climate change).

Policy Unit	Policy Choice
Rural Lostock and Yarrow communities	Policy Option 3: Continue with existing or alternative actions to manage flood risk at the current level.

Table 4-3 CFMP management units in the River Douglas CFMP

River Wyre Final Main Stage Report Catchment Flood Management Plan (CFMP) (December 2009)

The River Wyre Catchment Flood Management Plan (CFMP) predominantly covers the Boroughs of Blackpool and a small area of Preston City Council area. The River Wyre CFMP considers flooding over an area covering the River Wyre catchment and all of its tributaries. The document gives an overview of flood risk in the River Wyre catchment and sets out a preferred plan for sustainable flood risk management over the next 50 - 100 years.

The River Wyre CFMP area has been divided into six Policy Units, three of which cover the area within the Central Lancashire and Blackpool water cycle study area. The policy units within the Douglas CFMP are based on clearly defined areas within the catchment and are based on physical characteristics (including hydrology, ecology, geomorphology, land use etc) and current and future flood risk. Determination of policy units was also influenced by the wider objectives in the catchment. One preferred appropriate policy will be applied across the policy unit.

The three policy units within the Central Lancashire and Blackpool water cycle study are outlined in Table 4-4 along with the draft flood risk management policy selected for each unit.

Policy Unit	Policy Choice
Upper Wyre	Policy Option 6: Take action with others to store water to manage runoff in locations that provide overall flood risk reduction or environmental benefits, locally, or elsewhere in the catchment.
Woodplumpton	Policy Option 3: Continue with existing or alternative actions to manage flood risk at the current level.
Wyre Urban	Policy Option 5: Take further action to reduce flood risk.

Table 4-4 CFMP flood management units in the Wyre CFMP

4.3.5 North West England and North Wales Shoreline Management Plan SMP2,consultation draft (October 2009)

A Shoreline Management Plan (SMP) provides a large-scale assessment of the risks associated with coastal erosion and flooding at the coast. It also presents policies to help manage these risks to people and to the developed, historic and natural environment in a sustainable manner. SMPs form an important part of the Department for Environment, Food and Rural Affairs (Defra) and Welsh Assembly Government (WAG) strategy for managing risks due to flooding and coastal erosion (Defra, 2006[5]).

The first generation of SMPs were completed for the coastline of England and Wales about ten years ago and are now being reviewed to ensure that they take account of the latest available information and our current understanding of flood and coastal erosion risks. The draft second generation Shoreline Management Plan (SMP2) is a non-statutory, high level policy document for coastal flood and erosion risk management planning. It sets out the policies for managing the risks of coastal erosion and tidal flooding over the next 100 years. The SMP2 splits the North Wales and North West coast into a number of sub-cells. Sub cell 11b covers the coastal areas within the Central Lancashire and Blackpool water cycle study area.

Sub-cell 11b – Southport to Rossall Point, Fleetwood

This section of the Shoreline Management Plan covers the coast between Southport and Rossall Point near Fleetwood, and includes the Ribble estuary as well as the River Douglas. The Ribble estuary and its associated banks and channels exert a significant control on the evolution of both the important tourist areas of Southport frontage and the Fylde Peninsula.

The long term plan is to maintain protection of Southport and Preston, as well as large areas of low-lying agricultural land along the southern bank of the estuary, in combination with seeking further opportunities for habitat creation and creating set back areas to help reduce flood risk and manage the impact of defences on the estuary in the longer term. Along the River Douglas the plan is to continue to manage risks to assets on the extensive flood plain throughout much of its length.

The Fylde Peninsula sits between the Ribble estuary, to the south, and Morecambe Bay, to the north, and is backed by the Wyre estuary, and at a large scale it has potential to be affected by changes within these systems. The long term plan is to continue to provide protection through maintenance of formal defences in combination with encouraging the natural dune system to evolve where possible, as a natural form of defence. Dune management should allow the dunes to supply material to feed Lytham frontage, however, there may be a need to construct localised set back defences behind the current dunes for additional flood protection to low lying areas behind.

From central Blackpool to Anchorsholme, up to 30m high protected cliffs back the sand beach, while north of Anchorsholme the frontage is low lying and potentially at flood risk from both the

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[5] Defra (2006). Shoreline Management Plan Guidance. March 2006.

open coast and the Wyre estuary. The long term plan is to provide continued protection to the major tourist centre of Blackpool and the residential areas of Thornton and Cleveleys.

4.3.6 Currently ongoing Flooding Studies

Surface Water Management Plans (SWMPs) are currently being undertaken by Blackpool Borough and Preston City. They were not available for review during the prodution of this report.

Preston Surface Water Management Plan

Lancashire County Council has commissioned the preparation of a Surface Water Management Plan for Preston. This covers the whole of the local authority administrative area and has the following objectives:

- Attain a better understanding of surface water flood risks to people, property, infrastructure and the environment.
- Develop a robust surface water management policy which will make people safer from the risk of flooding.
- Address environmental concerns and seek opportunities for environmental enhancement.
- Comply with requirements of the Flood Risk Regulations 2009 and likely requirements of the Flood and Water Management Bill.
- Determine viable solutions to reduce the risk of surface water flooding and a 'preferred' portfolio of options from a social, economical, environmental and technical perspective.
- Solutions should aim to promote sustainable growth and regeneration.
- Effectively communicate flood risk to those who may be impacted and encourage community involvement in solutions.
- Attain a better understanding of the role of the sewerage system in surface water management and how solutions can support the resolution of sewerage problems.
- Prepare an Action Plan which identifies what actions need to be undertaken by who and by when.
- Identify funding sources to support surface water management and to implement the Action Plan.

- The Preston SWMP should assist in development of a wider strategy for surface water management across Lancashire.

Preparation of the SWMP has reached stage 3 – option evaluation. A number of generic options have been assessed and the next stage will be to prepare an action plan. This will be based on the work carried out up to the current stage and will form part of the final report.

Blackpool Surface Water Management Plan

We understand that at the time of writing the document is in a draft stage and is due to be circulated to partners and key stakeholders in the coming week. The report does not encompass any modelling work. The expected completion date is currently unknown, but we anticipate that once circulated amongst the key stakeholders for consultation the document will be finalised before being approved internally.

Prelinimary Flood Risk Assessments (PFRAs) are currently being undertaken by Blackpool and Central Lancashire and should be completed in December 2011.

The Environment Agency's Flood Map for Surface Water was provided to the Lead Local Flood Authorities in December 2010 but was not available in time for review for this document.

4.4 Preston City

The SFRA states that the River Ribble defines the main hydrological influences within Preston, which is tidally influenced through Preston, whilst a number of smaller watercourses run through the north of the city. In general fluvial and tidal flood risk across the city is low; however certain areas such as southwest Preston and near to the centre of the city do have a medium to high level of flood risk. In addition there are a number of smaller settlements adjacent to the main urban area of the city which have a limited risk of fluvial and tidal flooding.

The Level 1 SFRA identified sewer flooding incidents using historical records from United Utilities DG5 database (June 2007) detailing the number of flood events that affected both internal and external property in a six month period. Whilst due to the sensitive nature of DG5 data it is not possible to pin-point exact locations of flooding, however Grimsargh and its surrounding area were shown to have been particularly affected by sewer flooding. Whilst surface water and sewer flooding do not appear to be a significant issue within Preston new development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these towns. Surface water management is discussed in Chapter 5.

For the urban area of Preston, the existing fluvial flood risk is relatively low, with just over 10% of the existing settlement located within Flood Zones 2 and 3, however almost 5% of flood risk area is within Flood Zone 3b (Functional Floodplain). Further constraint to development may be presented by the Lancaster Canal. For development proposed adjacent to the canal, a Level 2 SFRA or developer led FRAs will be required to assess the residual risk from breach or overtopping of the canal.

The rural settlements within Preston City have a very limited fluvial and tidal flood risk, with only the settlements of Grimsargh and Goosnargh being at risk of fluvial and tidal flooding. The settlement of Grimsargh has approximately 0.67% of its development area within Flood Zones 2 and 3 with the settlement of Goosnargh having approximately 0.08% of its development area within Flood Zones 2 and 3.

In summary it is considered that flood risk will not be a barrier to development, because there is sufficient land at low flood risk to allow development to occur outside of flood risk areas. The key issues identified are outlined below:

- Preston – some minor flood risk constraints along the River Ribble and minor watercourses in the north of the city. Lancaster Canal will need to be considered should development occur adjacent to the canal.

- No issues identified in the rural settlements of Grimsargh and Goosnargh.

Detailed analysis of flood risk for each development site is given in the Preston Red-Amber-Green Assessment table in Chapter 9.

4.5 Chorley Borough

Chorley Borough lies within the River Douglas catchment which has an area of approximately 460 km^2 and drains the centre of Chorley. The main tributary of the River Douglas is the River Yarrow, which has its headwaters at the Rivington Reservoirs. From Rivington, the River Yarrow flows westwards towards the settlements of Chorley and Euxton. In general fluvial and tidal flood risk across the borough is low; however certain areas such as Croston do have a large proportion of development area at risk from fluvial and tidal flooding.

The Level 1 SFRA identified sewer flooding incidents using historical records from United Utilities DG5 database (June 2007) detailing the number of flood events that affected both internal and external property in a six month period. Whilst due to the sensitive nature of DG5 data it is not possible to pin-point exact locations of flooding, Euxton and its surrounding area was shown to have been particularly affected by sewer flooding. Whilst surface water and sewer flooding do not appear to be a significant issue within Chorley Borough limits new development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these towns. Surface water management is discussed in Chapter 5.

Flood risk in urban areas within Chorley Borough has been assessed below.

- Adlington: limited flood risk within development area with only 0.9% of development area being within Flood Zone 2 and 3.

- Chorley: limited flood risk within development area with only 0.9% of development area being within Flood Zone 2 and 3.

- Clayton Brook: limited flood risk within development area with only 0.3% of development area being within Flood Zone 2 and 3.

- Coppull: all development areas are within Flood Zone 1

- Euxton: limited flood risk within development area with only 1.1% of development area being within Flood Zone 2 and 3.

- Whittle-le-Woods: limited flood risk within development area with only 6% of development area being within Flood Zone 2 and 3.

The majority of rural settlements within Chorley Borough have a very limited fluvial and tidal flood risk, however the settlement of Croston has significant flood risk issues and potential development within the settlement could be severely constrained. Over 80% of the settlement area is situated within Flood Zone 2 and 3, with over 8% of that area within Flood Zone 3b, Functional Floodplain.

In summary it is considered that flood risk will not be a barrier to development in the majority of settlements, because there is sufficient land at low flood risk to allow development to occur outside of flood risk areas. The key issues are identified below:

- Flood risk should not be a constraint to development in the urban settlements with only limited flood risk zones present.

- Flood risk should not be a constraint to development in the rural settlements, with the exception of Croston which has considerable flood risk present.

Detailed analysis of flood risk for each development site is given in the Chorley Red-Amber-Green Assessment table in Chapter 10.

4.6 South Ribble Borough

South Ribble Borough lies within the River Ribble catchment with the Ribble forming the boundary between Preston City and South Ribble Borough. The Ribble CFMP notes that the Ribble covers a total distance of 100km and has its source in the Yorkshire Dales. The main tributary of the Ribble within South Ribble Borough is the River Darwen, which has its confluence with the Ribble near Walton-le-Dale. In general fluvial and tidal flood risk across the borough is low; however certain areas such as Walton-le-Dale and Higher Walton do have a large proportion of development area at risk from fluvial flooding.

The Level 1 SFRA identified sewer flooding incidents using historical records from United Utilities DG5 database (June 2007) detailing the number of flood events that affected both internal and external property in a six month period. Whilst surface water and sewer flooding do not appear to be a significant issue within South Ribble Borough limits new development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these towns. Surface water management is discussed in Chapter 5.

Flood risk in urban areas within South Ribble Borough has been assessed below.

- Bamber Bridge: limited flood risk within development area with only 5% of development area being within Flood Zone 2 and 3.

- Farington: limited flood risk within development area with only 1% of development area being within Flood Zone 2 and 3.

- Leyland: limited flood risk within development area with only 9% of development area being within Flood Zone 2 and 3.

- Lostock Hall: limited flood risk within development area with only 3% of development area being within Flood Zone 2 and 3.

- Penwortham: limited flood risk within development area with only 8% of development area being within Flood Zone 2 and 3.

- Walton-le-Dale: high flood risk within development area with approximately 50% of development area within Flood Zone 2 and 3.

The majority of rural settlements within South Ribble Borough have a very limited fluvial and tidal flood risk, however the settlement of Higher Walton has significant flood risk issues and potential development within the settlement could be severely constrained. Almost 50% of the settlement is located within Flood Zone 3b, Functional Floodplain.

In summary it is considered that flood risk will not be a barrier to development in the majority of settlements, because there is sufficient land at low flood risk to allow development to occur outside of flood risk areas. The key issues are identified below:

- Flood risk should not be a constraint to development in the urban settlements with only limited flood risk zones present, with the exception of Walton-le-Dale. Development in Walton-le-Dale should be located in the areas of lowest flood risk and must not increase risk to existing development and areas identified as functional floodplain should be protected from development. Where parts of development sites are proposed within Flood Zones 2 and 3, developers should undertake a site-specific Flood Risk Assessment (FRA) to establish the extent of Flood Zones 2, 3a and 3b, and the future risk of climate change. Development within Flood Zone 2 should be restricted to the 'water compatible', 'less vulnerable' and 'more vulnerable' category (see Tables D.1-D.3 in PPS25 for definitions). Development within High Probability Flood Zone 3a should be restricted to the water compatible or 'less vulnerable' uses to satisfy the requirements of the Sequential Test.

- Flood risk should not be a constraint to development in the rural settlements, with the exception of Higher Walton which has considerable flood risk present. Development within Higher Walton in Flood Zone 3b should be restricted to 'water-compatible uses' and 'essential infrastructure' that has to be there. Table D2 from PPS 25 outlines the types of development included within this classification.

Detailed analysis of flood risk for each development site is given in the South Ribble Red-Amber-Green Assessment table in Chapter 12.

4.7 Blackpool Borough

Blackpool is relatively flat low lying land, although most lies above the 1 in 1000yr (0.1%) flood extent. It is protected in the west from coastal erosion and tidal inundation from the Irish Sea by concrete defences. A number of smaller defences maintained by the EA and Blackpool council exist further inland. In general fluvial and tidal flood risk across the borough is low; however certain areas such as Anchorsholme and Thornton do have a large proportion of development area at risk from fluvial and tidal flooding. There are no areas within Blackpool within Flood Zone 3b, Functional Floodplain.

The Level 1 SFRA identified sewer and surface water flooding incidents using historical records from United Utilities DG5 database detailing the number of flood events that affected both internal and external property in a six month period. Whilst surface water and sewer flooding does not appear to be a significant issue within Blackpool Borough limits, there are known issues in Anchorsholme and Marton Moss due to reliance on and inundation of the public sewerage system. Any new development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not enter the sewer system and doe not increase the risk of surface water flooding in these areas. Surface water management is discussed in Chapter 5.

Detailed analysis of flood risk for each development site is given in the Blackpool Red-Amber-Green Assessment table in Chapter 12.

4.8 Key recommendations and policies across the study area

Flood risk management is an important consideration within Central Lancashire and Blackpool water cycle study area. The area contains three main river catchments (River Ribble, River Douglas and River Wyre). Parts of some development sites and existing settlements are situated within existing Flood Zones 2 and 3 (as defined by the Environment Agency) and are therefore already at risk from fluvial flooding. In addition, there are a number of locations at risk of flooding from other sources. Key recommendations that apply throughout the sub-region are outlined below.

Developers need to follow the principles and requirements of national policy, most notably PPS25: Development and Flood Risk. Any new development should be located in the areas of lowest flood risk and must not increase risk to existing development and areas identified as functional floodplain should be protected from development. Where parts of development sites are proposed within Flood Zones 2 and 3, developers should undertake a site-specific Flood Risk

Assessment (FRA) to establish the extent of Flood Zones 2, 3a and 3b, and the future risk of climate change. Further modelling may be required to establish these risk areas.

It must be ensured that all new development is 'safe,' meaning that dry pedestrian access to and from the development is possible without passing through the 1 in 100 year plus climate change floodplain, and emergency vehicular access is possible.

A number of flood defences are located within the WCS area which provides benefit to a number of residential and commercial properties. Future development within existing urban areas may be required behind these defences. A Level 2 SFRA may be required for any development (brownfield and greenfield) proposed behind any existing defences to assess the residual risk to the site from breach or overtopping and to properly inform new development in the area. In line with the recommendations outlined in the Ribble, Douglas and Wyre CFMPs, defences must be properly maintained to ensure the required protection is provided in the future.

In addition, a number of canals and reservoirs are located within the sub-region. Whilst the risk of breach or overtopping is generally considered low, for any development proposed adjacent to canals, a Level 2 SFRA must be undertaken to assess the residual risk of breach or overtopping. This will enable the new development to be appropriately informed, and appropriate emergency plans developed by the LPA.

Account must be taken of storage areas within the sub-region, with support given to flood alleviation measures under consideration by the Environment Agency by safeguarding possible sites for flood storage and other channel works. Opportunities should be identified for setting back defences which will increase localised storage and could in turn allow for the creation of a more natural channel.

It may be possible to cluster potential development areas together to consider strategic flood risk management activities that would provide a strategic benefit and bring benefit to the wider community.

4.9 Recommendations and policies for dealing with windfall developments

For the purposes of development management, detailed policies will need to be set out to ensure that flood risk is taken account of appropriately for both allocated and non-allocated 'windfall' sites. The following reflects the minimum requirements under PPS25 (reference should be made to Tables D.1-D.3 in PPS25).

Future Development within Flood Zone 1

In this zone, developers and local authorities should realise opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development. There is no significant flood risk constraint placed upon future developments within the Low Probability Flood Zone 1, although for sites larger than one hectare, the vulnerability from other sources of flooding should be considered as well as the effect of the new development on surface water runoff.

Typically, a Drainage Impact Assessment will be required to demonstrate that runoff from the site is reduced, thereby reducing surface water flood risk. This will involve the use of SUDS techniques which should take into account the local geological and groundwater conditions (See Chapter 5). For green field sites, post-development runoff should be attenuated and discharge rates set at annual green field rates of flow. For re-development of brown field sites, post-development run off should be attenuated and at least a 20% reduction in discharge rates should be provided when compared to pre-development rates, as required by the Environment Agency.

Future Development within Flood Zone 2

Land use within Medium Probability Flood Zone 2 should be restricted to the 'water compatible', 'less vulnerable' and 'more vulnerable' category. Where other planning pressures dictate that development of 'highly vulnerable' land uses should proceed, it will be necessary to ensure that the requirements of the Exception Test are satisfied. The following should be considered:

- A detailed site-specific FRA should be prepared in accordance with PPS25 and Council planning policies.

- Floor levels should be situated above the 100 year plus climate change predicted maximum level plus a minimum freeboard of 600mm.

- The development should be safe, meaning that dry pedestrian access to and from the development should be possible above the 1 in 100 year plus climate change flood level and emergency vehicular access should be possible during times of flood.

- SUDS should be implemented to ensure that runoff from the site (post development) is reduced. For green field sites, post-development runoff should be attenuated and discharge rates set at annual green field rates of flow. For re-development of brown field sites, post-development run off should be attenuated and at least a 20% reduction in discharge rates should be provided when compared to pre-development rates, as required by the Environment Agency. Space should be set-aside for SUDS.

- The proposed development should be set-back from the watercourse with a minimum 8m wide undeveloped buffer zone, to allow appropriate access for routine maintenance and emergency clearance. This is an Environment Agency requirement.

Future development within High Probability Flood Zone 3a

Land-use with High Probability Flood Zone 3a should be restricted to the water compatible or 'less vulnerable' uses to satisfy the requirements of the Sequential Test. For 'more vulnerable' uses it is necessary to ensure that the requirements of the Exception Test are satisfied. The following should be considered:

- A detailed site-specific FRA should be prepared in accordance with PPS25 and Council planning policies. Properties situated within close proximity to formal defences or water retaining structures (reservoirs/canals) will require a detailed breach and overtopping assessment to ensure that the potential risk to life can be safely managed throughout the lifetime of the development. The nature of any breach failure analysis should be agreed with the Environment Agency.

- The development should not increase flood risk elsewhere, and opportunities should be taken to decrease overall flood risk (such as use of SUDS and de-culverting). This can be achieved by developing land sequentially, with areas at risk of flooding favoured for green space.

- Floor levels should be situated above the 1% (100 year) plus climate change predicted maximum level plus a minimum freeboard of 600mm. Within defended areas the maximum water level should be assessed from a breach analysis.

- The development should allow dry pedestrian access to and from the development above the 1 in 100 year plus climate change flood level and emergency vehicular access should be possible during times of flood. An evacuation plan should be prepared. With respect to new developments, those proposing the development should take advice from the LPAs emergency planning officer and for large-scale developments, the emergency services, when producing an evacuation plan as part of a FRA. All access requirements should be discussed and agreed with the Environment Agency.

- Basements should not be used for habitable purposes. Where basements are permitted for commercial use, it is necessary to ensure that the basement access points are situated 600 mm above the 1 in 100 year flood level plus climate change.

- SUDS should be implemented to ensure that runoff from the site (post development) is reduced. For green field sites, post-development runoff should be attenuated and discharge rates set at annual green field rates of flow. For re-development of brown field sites, post-development run off should be attenuated and at least a 20% reduction in discharge rates should be provided when compared to pre-development rates, as required by the Environment Agency. Space should be set aside for SUDS.

- The proposed development should be set-back from the watercourse with a minimum 8m wide undeveloped buffer zone, to allow appropriate access for routine maintenance and emergency clearance.

Future development within Functional Floodplain Zone 3b

Development should be restricted to 'water-compatible uses' and 'essential infrastructure' that has to be there. Table D2 from PPS 25 outlines the types of development included within this classification. It should be noted that 'essential infrastructure' includes essential transport infrastructure (including mass evacuation routes) which may have to cross the area at risk as well as strategic utility infrastructure such as electricity generating power station and grid and primary substations. Reference should be made to Table D2 of PPS 25 when considering development within Flood Zone 3b to ensure only appropriate development is considered. 'Essential infrastructure' in this zone must pass the Exception Test and be designed and constructed to remain operational in times of flood and not impede water flow.

5 Surface water drainage

5.1 Introduction

The surface water drainage assessment for the Central Lancashire and Blackpool Outline WCS has been carried out to:

- identify the types of Sustainable Drainage Systems (SUDS) which may be applicable across the county;
- make policy recommendations about the use of sustainable surface water drainage techniques across the county, and;
- identify the runoff rates and volumes required from urban extensions to ensure that runoff rate and volume from the development site does not exceed greenfield runoff rates and volumes up to the 1 in 100 year rainfall event, plus an allowance for climate change.

5.1.1 Overview of sustainable surface water drainage

Table 5-1 summarises the different SUDS techniques and their applicability to reduce flow rate, volume and provide water quality, amenity or biodiversity benefits. The table also summarises the scale at which the SUDS techniques can generally be applied.

General information					Performance							Site suitability	
SUDS technique	Description	Applicable scale	Highly suitable for	Suitable for urban creep / household extensions	Design return period	Peak flow reduction	Volume reduction	WQ treatment	Amenity potential	Ecology potential	Retrofit potential	Contaminated land above vulnerable groundwater (with liner)
Green roofs	Systems which cover a building's roof with vegetation (laid over a drainage layer)	Source	Large buildings with flat roofs Industrial / commercial areas	Possibly	1 in 2 years	Medium	Medium	Good	Good	Good	Yes	Yes
Soakaways	Square or circular excavations filled with rubble or lined, and can be used to store and infiltrate runoff	Source / Site	Low-medium density housing Large buildings with land available	Yes	1 in 10 years	Good	Good	Good	Poor	Poor	Yes	No
Water butts	Offline storage devices used for capturing and storing roof runoff	Source	All scales of development	Yes	N/A	Low	Low	Low	Poor	Poor	Yes	Yes
Rainwater harvesting	Rainwater from roofs and hard surfaces can be stored and used	Source	Low and high density residential areas Large single-ownership building with land	Yes	N/A	High	High	Poor	Poor	Poor	Yes	Yes

General information					Performance							Site suitability	
SUDS technique	Description	Applicable scale	Highly suitable for	Suitable for urban creep / household extensions	Design return period	Peak flow reduction	Volume reduction	WQ treatment	Amenity potential	Ecology potential	Retrofit potential	Contaminated land above vulnerable groundwater (with liner)
			available									
Filter strips	Wide, sloping areas of grass that treat runoff from adjacent impermeable areas	Source / Site	Low-medium density residential areas Open green space Roads and footpaths with ample space available		N/A	Poor	Poor	Medium	Medium	Medium	Yes	No
Trenches (Infiltration)	Trenches filled with stone designed to convey +/or store runoff (they can infiltrate)	Source (Conveyance)	Hard standing areas Car parks		1 in 5 years	Medium	High	High	Low	Low	Yes	No

General information					Performance							Site suitability	
SUDS technique	Description	Applicable scale	Highly suitable for	Suitable for urban creep / household extensions	Design return period	Peak flow reduction	Volume reduction	WQ treatment	Amenity potential	Ecology potential	Retrofit potential	Contaminated land above vulnerable groundwater (with liner)
Trenches (Filter)	Trenches filled with stone designed to convey +/or store runoff	Conveyance	Highway drainage Conveying surface water to other storage areas		1 in 5 years	Medium	Low	High	Low	Low	Yes	Yes
Swales	Shallow channels designed to convey runoff and reduce pollutants	Source / Site (Conveyance)			1 in 10 years	Medium	Medium	Good	Medium	Medium	Limited	Yes
Bio-retention	Shallow depression on surface that are under drained and remove pollution and reduce runoff volumes	Source / Site	Large open green space		Max. 1 in 10 years	Medium	Medium-High with infiltratio n	Good	Good	Medium	Yes	Yes
Pervious pavements	Allow rainwater to infiltrate through the surface to an underlying storage area	Source / Site	Residential roads (e.g. estates) Car parks Hard standing areas, e.g. shopping areas	Yes	1 in 100 years	Good	Good	Good	Poor	Poor	Yes	Yes

General information					Performance						Site suitability	
SUDS technique	Description	Applicable scale	Highly suitable for	Suitable for urban creep / household extensions	Design return period	Peak flow reduction	Volume reduction	WQ treatment	Amenity potential	Ecology potential	Retrofit potential	Contaminated land above vulnerable groundwater (with liner)
Geo-cellular / modular systems	Modular plastic geocellular systems with a high void ratio that can be used to create a below ground soakaway or storage structure	Source / Site / Regional (Conveyance possible)			1 in 100 years	Good	Poor - Good with infiltratio n	Poor	Poor	Poor	Yes	Yes
Sand filters	Single or multi-chambered structures to treat surface water runoff through filtration using a sand bed as the primary filter medium.	Site / Regional	SW and highway drainage Low-medium density housing Large buildings with land available		N/A	Poor	Poor	Good	Poor	Poor	Yes	Yes
Infiltration basins	Depressions designed to store and infiltrate runoff	Site	Large open green space		1 in 100 years	Average	Good	Good	Good	Good	No	No
Detention basins	Dry basins which are designed to store a certain volume of runoff and provide some WQ treatment	Site / Regional			1 in 100 years	Good	Poor	Medium	Good	Medium	Yes	Yes

General information					Performance						Site suitability	
SUDS technique	Description	Applicable scale	Highly suitable for	Suitable for urban creep / household extensions	Design return period	Peak flow reduction	Volume reduction	WQ treatment	Amenity potential	Ecology potential	Retrofit potential	Contaminated land above vulnerable groundwater (with liner)
Ponds	Basins with a permanent pool of water for WQ treatment. Provide temporary storage for storm runoff	Site / Regional			1 in 100 years	Good	Poor	Good	Good	Good	Unlikely	Yes
Stormwater wetlands	Comprise of shallow ponds and marshy areas providing stormwater attenuation and treatment	Site / Regional (Conveyance)			1 in 100 years	Good	Poor	Good	Good	Good	Unlikely	Yes

Table 5-1 Summary of SUDS techniques and their applicability (based on information derived from CIRIA manuals C609 and C697)

NB: The design return period in this table has been provided to illustrate suitable rainfall probabilities which different SUDS can be designed for. The values quoted are not specifying design standards. It should be noted that during design of SUDS, an allowance should be made for climate change (either 20% or 30% peak rainfall intensity increases).

5.1.2 Costs of sustainable surface water drainage

The CIRIA SUDS manual (C697) provided indicative construction costs, and operation and maintenance costs for various elements of sustainable drainage systems. Inevitably, the costs are influenced by multiple factors, but the SUDS manual does indicate that the "total volume or area of a component is likely to be a strong predictor of cost." Indicative capital costs, and operation and maintenance costs, are provided in Table 5-2 (it should be noted that these are 2004 prices).

Component	Capital cost		Operation and maintenance cost	
	Cost (£)	Unit	Annual Cost* (£)	Unit
Filter drain	£100-£140	/m^3 stored volume	£0.2-£1	/m^2 of filter surface area
Infiltration trench	£55-£65	/m^3 stored volume		
Soakaway	>£100	/m^3 stored volume	£0.1	/m^2 of treated area
Permeable pavement	£30-£40	/m^2 permeable surface	£0.5-£1	/m^3 of storage volume
Infiltration basin	£10-£15	/m^3 detention volume	£0.1-£0.3	/m^2 detention basin area
Detention basin	£15-£20	/m^3 detention volume		
Wetland	£25-£30	/m^3 treatment volume	£0.1	/m^2 of wetland surface area
Retention Pond	£15-£25	/m^3 treatment volume	£0.5-£1.5	/m^2 of retention pond surface area
Swale	£10-£15	/m^2 swale area	£0.1	/m^2 of swale surface area
Filter strip	£2-£4	/m^2 filter strip area	£0.1	/m^2 of filter surface area

Table 5-2 Capital costs and operation and maintenance costs (from SUDS manual)

* Annual cost (for regular maintenance only)

5.2 Methodology

5.2.1 Mapping

The data and information used for this section of the outline WCS is outlined in Chapter 3. Maps have been produced for each local authority area to illustrate the available data. For the aquifer and geological mapping, the maps on the appropriate websites were consulted. The maps are used to identify whether infiltration, attenuation or combination (infiltration / attenuation) type SUDS are likely to be more appropriate within each development area.

The Environment Agency has classified[6] aquifers in England and Wales depending on their permeability and importance for water supply, as summarised in Table 5-3. The aquifer classification, in conjunction with the pollution attenuation properties of the soil, has been used to define groundwater vulnerability ratings, which can be used to asses the potential impacts of new developments. The soil classes are summarised below, in Table 5-4.

Classification	Description
Principal	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
Secondary A	Permeable rock layers or drift deposits capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Secondary B	Predominantly lower permeability rock layers or drift deposits which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
Secondary Undifferentiated	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Table 5-3 Environment Agency aquifer classification

[6]) The Environment Agency's aquifer classification system has been newly redefined in April 2010 to be consistent with the Water Framework Directive. The new classifications described above replace the previous, roughly equivalent, designations of 'Major', 'Minor' and 'Non-aquifer'. The new aquifer mapping is available online at the Environment Agency website, but so far cannot be obtained as GIS layers.

Leaching Potential	Soil Classes
High – soils with little ability to attenuate diffuse source pollutants and in which non-adsorbed diffuse source pollutants have the potential to move rapidly to underlying strata or to shallow groundwater.	**H1** – soils which readily transmit liquid discharges
	H2 – soils which readily transmit a wide range of pollutants
	H3 – soils which readily transmit non-adsorbed pollutants and liquids but which have some attenuation ability
	HU – soil information for urban areas is less reliable so the worst case is assumed
Intermediate – soils with a moderate ability to attenuate diffuse source pollutants or in which it is possible that some non-adsorbed diffuse source pollutants and liquids cold penetrate the soil layer.	**I1** – soils which can possibly transmit a wide range of pollutants
	I2 – soils which can possibly transmit non- or weakly adsorbed pollutants or liquids, but are unlikely to transmit adsorbed pollutants
Low – soils in which pollutants are unlikely to penetrate the soil layer.	**L**

Table 5-4 Environment Agency groundwater vulnerability classification

The Environment Agency has also defined groundwater source protection zones (SPZs) around groundwater sources which are abstracted for potable use (which includes public water supply and food/drinks production). Three zones are defined, based on the time taken for pollutants entering the ground to reach the abstraction point. These are shown in Figures 5-1 to 5-4 in Appendix A and summarised in Table 5-5 below.

SPZ	Definition
Zone 1 (Inner Protection Zone)	'Any pollution that can travel to the borehole within 50 days from any point within the zone'
Zone 2 (Outer Protection zone)	'pollution that takes up to 400 days to travel to the borehole, or 25% of the total catchment area'
Zone 3 (Total Catchment)	'the total area needed to support removal of water from the borehole, and to support any discharge from the borehole'

Table 5-5 Definition of groundwater source protection zones

The methodology adopted for the assessment of SUDS suitability is outlined below:

The aquifer maps are used to identify the potential to infiltrate surface water runoff into the ground, since these give an indication of the permeability of the ground. Thus:

- principal aquifer = good potential for infiltration SUDS;
- secondary aquifer = moderate potential for infiltration SUDS, and;
- unproductive strata = poor potential for infiltration SUDS.

The classification derived from the aquifer maps were subsequently checked against both solid and drift geology information, and any anomalies were adjusted at this stage.

To ensure a groundwater quality element was included in the analysis, Source Protection Zones (SPZs) were used to identify where groundwater may be particularly vulnerable to pollution. The SPZ maps were used to create the following classification:

- SPZ 1 = high risk of groundwater pollution;
- SPZ 2 = moderate risk of groundwater pollution, and;
- SPZ 3 / None = low / no risk of groundwater pollution.

The information from the aquifer and SPZ maps were subsequently combined to create an assessment matrix, which could identify the potential suitability of SUDS approaches. The assessment matrix is shown in Table 5-6, and a more detailed breakdown of the criteria is shown in Table 5-7.

		Risk to groundwater pollution (based on SPZ)		
		1	**2**	**3 / None**
Drainage potential for infiltration SUDS	**Good**	G1	G2	G3 / G4
	Medium	M1	M2	M3 / M4
	Poor	Poor		

Table 5-6 Assessment matrix SUDS suitability

Category	Suitable SUDS	Description
G1	Attenuation	Although the geology is highly permeable the site is in Source Protection Zone 1 and therefore there is a presumption away from infiltration techniques. Depending on site specific characteristics some infiltration might be possible, but would need to be determined through site investigations
G2	Infiltration + treatment	Highly permeable geology makes infiltration SUDS applicable. Some consideration will need to be given to the treatment of runoff to protect groundwater
G3 / G4	Infiltration	Highly permeable geology makes infiltration SUDS applicable. Unlikely to be an issue with pollution of groundwater
M1	Attenuation	Although the geology is generally permeable the site is in Source Protection Zone 1 and therefore there is a presumption away from infiltration techniques. Depending on site specific characteristics some infiltration might be possible, but would need to be determined through site investigations
M2	Infiltration or attenuation + treatment	Suitable for infiltration or attenuation depending on the site specific characteristics. Some consideration will need to be given to the treatment of runoff to protect groundwater if infiltration is used

Category	Suitable SUDS	Description
M3 / M4	Infiltration or attenuation	Suitable for infiltration or attenuation depending on the site specific characteristics. Unlikely to be an issue with pollution of groundwater
Poor	Attenuation	Low permeability geology means that infiltration SUDS are less likely to be applicable although this should be confirmed by site investigations

Table 5-7 Detailed information on assessment matrix for SUDS suitability

Whilst a high level assessment has been undertaken, it should be noted that detailed site geological surveys should be undertaken by developers as required, as a part of the planning application process to define the most suitable SUDS options. It is important to note that *a groundwater risk assessment will be required for any site where infiltration SUDS are proposed.* SUDS infiltration for discharges to ground, from surface water from roads, vehicle parking and amenity areas are subject to agreement by the SUDS Approval Board and should demonstrate compliance with the criteria set out in the forthcoming National SUDS Standards, including water quality, design and maintenance. The EA should be consulted regarding the risks to groundwater at an early stage, as it is likely that more detailed risk assessments would be required for those sites located in, or near to, source protection zones, or where groundwater is found at shallow depths. Reference should be made to the Environment Agency Groundwater Protection: Policy and Practice (GP3) Part 4, 2008 edition 1 (http://www.environment-agency.gov.uk/research/library/publications/40741.aspx).

5.2.2 Surface runoff calculations

For major development areas of over 500 houses, a surface water drainage assessment has been carried out, which builds upon the mapping. Approximate storage volumes and allowable runoff rates have been calculated which should be taken into account for SUDS design at an early stage. The calculation method is outlined in the joint Defra / Environment Agency R&D Technical Report "Preliminary rainfall runoff management for developments" (Environment Agency 2007)7. This method provides initial, conservative estimates of the increase in peak flow and volume of runoff from proposed developments. For this assessment it should be noted the assumed housing density was 40 houses/ha, and 75% of the developable area would become impermeable.

For each major development site analysed, storage volumes are broken down into attenuation storage which is provided to restrict the rate of runoff to the peak runoff rate for the site predevelopment, and long term storage which reduces the volume of runoff to the predevelopment runoff volume. Developers will be required to provide sufficient storage to meet the combined total of long term and attenuation storage.

In addition, Nitrate Vulnerable Zones (NVZs), local groundwater policy and groundwater emergence maps were checked to provide a more detailed assessment of the development sites. Nitrate Vulnerable Zones are shown in Figure 5-5 to 5-8 in Appendix A.

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[7] The Defra/EA technical report outlines three stormwater drainage design stages; 1) prior to or during Master Plan development, 2) At Master Plan / Environmental Impact Assessment, and 3) detailed planning of the site drainage. The calculations undertaken for the WCS are in line with the Defra/EA methodology, and are suitable for stage 1 of the stormwater drainage design. Stage 1 provides an initial estimate of storage volumes to assist initial discussions between local authorities and the Environment Agency.

It should be stressed that developers should only use the outline WCS figures as indicative. Developers should devise their own strategy and include the appropriate level of detail within their outline planning application.

5.3 Preston City Overview

The bedrock geology within Preston tends to be Triassic sandstone and conglomerate in the west and south, and Bowland High Group and Craven Group (mudstone, siltstone and sandstone) in the north east. Most of the District is covered by superficial deposits of Till, but there are also patches of Alluvium along the River Ribble, and Glacial sand and gravel in central Preston and the north east of the Borough.

An assessment of the geology in terms of aquifer types is illustrated in Table 5-8.

Principal (bedrock)	**Secondary A (bedrock)**	**Secondary B (bedrock)**	**Non-aquifers**
Triassic rocks (undifferentiated) – sandstone and conglomerate, interbedded.	Bowland High Group and Craven Group (Undifferentiated) – mudstone, siltstone and sandstone.		.
Principal (superficial)	**Secondary A (superficial)**	**Secondary B (superficial)**	**Non-aquifers**
	Alluvium; Glacial sand and gravel.		Till

Table 5-8 Aquifer Units in the Preston City Council area

Principal aquifers are more permeable and are much more likely to be suitable for infiltration SUDS approaches.

Triassic Sandstone is highly permeable, and it is therefore deemed to have a higher potential for infiltration SUDS. However, the high permeability of the rock means that it is in use as a water resource. The SPZ indicate boreholes need to be protected. Therefore, whilst infiltration SUDS should be largely applicable, due consideration should be given to the presence of SPZs when determining whether infiltration SUDS are likely to be applicable. Table 5-9 illustrates EA policy on SPZs.

Secondary Aquifers are typically less permeable but may still be suitable for infiltration SUDS. For superficial deposit aquifers in particular, the suitability for SUDS will also be highly dependant on local conditions, such as depth to groundwater since high groundwater levels could prevent effective infiltration.

Much of Preston has superficial deposits of Till which is indicated as Unproductive Strata (i.e. non aquifer). In these areas, the low permeability of the overlying Till layer may prevent infiltration SUDS being feasible, even where the bedrock is more permeable. In these areas therefore, attenuation based SUDS will generally be more applicable.

The more permeable sites should have priority given to infiltration drainage techniques, as opposed to discharging surface water to watercourses. Where less permeability is found and infiltration techniques that rely on discharge into the existing soils are not viable (also due to a high water table, source protection zones, contamination etc), discharging site runoff to watercourses is preferable to the use of sewers. Integrated urban drainage should also be used throughout the design process and early consultation with Preston City Council and the Environment Agency is essential for all development sites to identify the types of SUDS likely to be applicable.

There is a nitrate vulnerable zone across rural areas to the north of Preston urban area as shown on Figure 5.5 in Appendix A. Therefore, if surface water drainage is discharged to a watercourse the developer should assess the risk of nitrates in surface water entering the watercourse[8].

There are two small SPZ 1 areas within Preston, to the west and south of Broughton. The western one is surrounded by a small SPZ 2 area, but this is not visible for the southern one. Much of the west and south of the borough is within SPZ 3. As a general rule, infiltration SUDS will not be applicable within SPZ 1 because of the risk of groundwater pollution. Some infiltration of roof runoff may be possible, subject to the constraints identified in Table 5-9. The area in SPZ 2 is at lower risk of polluting groundwater sources, but some additional SUDS treatment might be required where infiltration approaches are used.

	Within SPZ1	**Outside SPZ1**
Environment Agency Policy	Only clean roof drainage may be infiltrated, with the following conditions: - drains must be sealed to prevent ingress of surface drainage; - pathways for contaminant migration must not be created and in-ground contamination must not be mobilised; - hydrogeological risk assessment demonstrates insignificant risk.	Infiltration of potentially contaminated runoff is prohibited. However, infiltration of SuDS (and STW) discharges is permitted, provided that: - a hydrogeological risk assessment can demonstrate adequate protection for groundwater; - arrangements for effective management and maintenance of the SUDS are in place. There is a presumption against the use of deep soakaways, bypassing the soil zone, unless: - there is no viable alternative; - treatment is in place; - a hydrogeological risk assessment demonstrates insignificant risk.

Table 5-9 Environment Agency policy on SPZs (Environment Agency Groundwater Protection: Policy and Practice (GP3) Part 4, 2008 edition 1 - http://www.environment-agency.gov.uk/research/library/publications/40741.aspx)

A further factor to take into account is where a site lies within flood zone 2 or 3. As a general rule, SUDS should be built outside of flood zone 2 and 3 as a preference, or up to the 100 year event plus climate change as a minimum. If SUDS are constructed in areas of flood risk there is a possibility the river could flood the SUDS features, thus reducing their capacity and ability to perform their drainage function properly.

[8] It is unlikely that there will be high levels of nitrates in surface water runoff, but there can be nitrogenous waste in plants (e.g. leaves) which can be nitrified into nitrates. This is considered a low risk, and well designed SUDS, which include a treatment element, should mitigate this risk.

5.4 South Ribble Borough Overview

The bedrock geology within South Ribble includes some Triassic sandstone and conglomerate through the centre of the Borough, roughly where the motorways are, and a thin strip along the north west boundary of the Borough. The main south western part of the Borough is Triassic mudstone, sandstone and siltstone rock. To the east of the Borough, the bedrock tends to be Millstone Grit. There are superficial deposits of Alluvium along the northern and western borders, following the rivers, and also around the M6-M65 junction. There are patches of River Terrace Deposits in the north east of the Borough, Glacial Sand and Gravel just south of Leyland and Peat west of Farington Moss. The rest of the Borough is covered by Till.

An assessment of the geology in terms of aquifer types is illustrated in Table 5-8.

Principal (bedrock)	**Secondary A (bedrock)**	**Secondary B (bedrock)**	**Non-aquifers**
Triassic rocks (undifferentiated) – sandstone and conglomerate, interbedded.	Millstone Grit – mudstone, siltstone and sandstone.	Triassic rocks (undifferentiated) – mudstone, siltstone and sandstone.	.
Principal (superficial)	**Secondary A (superficial)**	**Secondary B (superficial)**	**Non-aquifers**
	Alluvium; River Terrace Deposits		Till

Table 5-10 Aquifer Units of South Ribble

Principal aquifers are more permeable and are much more likely to be suitable for infiltration SUDS approaches.

The Sandstone and Conglomerate Triassic Rock type is highly permeable, and it is therefore deemed to have a higher potential for infiltration SUDS. However, the high permeability of the rock means that it is in use as a water resource. The SPZ indicate boreholes which need to be protected. Therefore, whilst infiltration SUDS should be largely applicable, due consideration should be given to the presence of SPZs when determining whether infiltration SUDS are likely to be applicable.

Secondary Aquifers are typically less permeable but may still be suitable for infiltration SUDS. For superficial deposit aquifers in particular, the suitability for SUDS will also be highly dependant on local conditions, such as depth to groundwater since high groundwater levels could prevent effective infiltration.

Much of South Ribble has superficial deposits of Till which is indicated as Unproductive Strata (i.e. non aquifer). In these areas, the low permeability of the overlying Till layer may prevent infiltration SUDS being feasible, even where the bedrock is more permeable. In these areas therefore, attenuation based SUDS will generally be more applicable.

The more permeable sites should have priority given to infiltration drainage techniques, as opposed to discharging surface water to watercourses. Where less permeability is found and infiltration techniques that rely on discharge into the existing soils are not viable (also due to a high water table, source protection zones, contamination etc), discharging site runoff to watercourses is preferable to the use of sewers. Integrated urban drainage should also be used throughout the design process and early consultation with South Ribble Borough Council and the Environment Agency is essential for all development sites to identify the types of SUDS likely to be applicable.

There is an area of SPZ 3 on the north east of the borough.

There is a nitrate vulnerable zone in the south west of the borough. Therefore, if surface water drainage is discharged to a watercourse the developer should assess the risk of nitrates in surface water entering the watercourse[9].

	Within SPZ1	**Outside SPZ1**
Environment Agency Policy	Only clean roof drainage may be infiltrated, with the following conditions: - drains must be sealed to prevent ingress of surface drainage; - pathways for contaminant migration must not be created and in-ground contamination must not be mobilised; - hydrogeological risk assessment demonstrates insignificant risk.	Infiltration of potentially contaminated runoff is prohibited. However, infiltration of SuDS (and STW) discharges is permitted, provided that: - a hydrogeological risk assessment can demonstrate adequate protection for groundwater; - arrangements for effective management and maintenance of the SUDS are in place. There is a presumption against the use of deep soakaways, bypassing the soil zone, unless: - there is no viable alternative; - treatment is in place; - a hydrogeological risk assessment demonstrates insignificant risk.

Table 5-11 Environment Agency policy on SPZs (Environment Agency Groundwater Protection: Policy and Practice (GP3) Part 4, 2008 edition 1 - http://www.environment-agency.gov.uk/research/library/publications/40741.aspx)

A further factor to take into account is where a site lies within flood zone 2 or 3. As a general rule, SUDS should be built outside of flood zone 2 and 3 as a preference, or up to the 100 year event plus climate change as a minimum. If SUDS are constructed in areas of flood risk there is a possibility the river could flood the SUDS features, thus reducing their capacity and ability to perform their drainage function properly.

5.5 Chorley Borough Overview

The bedrock geology within Chorley tends to be Millstone Grit in the north east, Pennine and South Wales Lower Coal Measures in the south east, Triassic sandstone and conglomerate in the south west and Triassic mudstone, siltstone and sandstone in the north west. There are superficial deposits of Glacial Sand and Gravel

[9] It is unlikely that there will be high levels of nitrates in surface water runoff, but there can be nitrogenous waste in plants (e.g. leaves) which can be nitrified into nitrates. This is considered a low risk, and well designed SUDS, which include a treatment element, should mitigate this risk.

south of Leyland, near Heapey, near Worthington and just east of Hoghton. There is a strip of Alluvium near Preston Road and in the west of the Borough. There is an area of Blown Sand in the south west of the Borough. There is a patch of Peat along Wigan Lane and in the hills along the Borough's eastern border. The rest of the Borough has a superficial layer of Till.

An assessment of the geology in terms of aquifer types is illustrated in Table 5-8.

Principal (bedrock)	**Secondary A (bedrock)**	**Secondary B (bedrock)**	**Non-aquifers**
Triassic rocks (undifferentiated) – sandstone and conglomerate, interbedded.	Millstone Grit Group – mudstone, siltstone and sandstone. Pennine lower coal measures formation and South Wales lower coal measures formation (undifferentiated).	Triassic rocks (undifferentiated) – mudstone, siltstone and sandstone.	
Principal (superficial)	**Secondary A (superficial)**	**Secondary B (superficial)**	**Non-aquifers**
	Alluvium; Glacial sand and gravel.		Till Peat

Table 5-12 Aquifer Units of Chorley

Principal aquifers are more permeable and are much more likely to be suitable for infiltration SUDS approaches.

Secondary Aquifers are typically less permeable but may still be suitable for infiltration SUDS. For superficial deposit aquifers in particular, the suitability for SUDS will also be highly dependant on local conditions, such as depth to groundwater since high groundwater levels could prevent effective infiltration.

Much of Chorley has superficial deposits of Till which is indicated as Unproductive Strata (i.e. non aquifer). In these areas, the low permeability of the overlying Till layer may prevent infiltration SUDS being feasible, even where the bedrock is more permeable. In these areas therefore, attenuation based SUDS will generally be more applicable.

The more permeable sites should have priority given to infiltration drainage techniques, as opposed to discharging surface water to watercourses. Where less permeability is found and infiltration techniques that rely on discharge into the existing soils are not viable (also due to a high water table, source protection zones, contamination etc), discharging site runoff to watercourses is preferable to the use of sewers. Integrated urban drainage should also be used throughout the design process and early consultation with Chorley Borough Council and the Environment Agency is essential for all development sites to identify the types of SUDS likely to be applicable.

There are no SPZ within the borough.

There is a nitrate vulnerable zone around most of the borders of the borough apart from the far north east. Therefore, if surface water drainage is discharged to a watercourse the developer should assess the risk of nitrates in surface water entering the watercourse[10].

A further factor to take into account is where a site lies within flood zone 2 or 3. As a general rule, SUDS should be built outside of flood zone 2 and 3 as a preference, or up to the 100 year event plus climate change as a minimum. If SUDS are constructed in areas of flood risk there is a possibility the river could flood the SUDS features, thus reducing their capacity and ability to perform their drainage function properly.

5.6 Blackpool Borough Overview

The bedrock geology within Blackpool is Triassic sandstone (of the mudstone, siltstone and sandstone type). There are superficial deposits of Till across most of the area, except for areas of Blown Sand in the south and Alluvium in the North.

An assessment of the geology in terms of aquifer types is illustrated in Table 5-8.

Principal (bedrock)	**Secondary A (bedrock)**	**Secondary B (bedrock)**	**Non-aquifers**
		Triassic rocks (undifferentiated) – mudstone, siltstone and sandstone.	
Principal (superficial)	**Secondary A (superficial)**	**Secondary B (superficial)**	**Non-aquifers**
	Blown sand. Alluvium.		Till

Table 5-13 Aquifer Units of Blackpool

No Principal aquifers are indicated within the Borough, however, there are superficial Secondary Type A aquifers which may be suitable for infiltration SUDS. Secondary Aquifers are typically less permeable but may still be suitable for infiltration SUDS. For superficial deposit aquifers in particular, the suitability for SUDS will also be highly dependant on local conditions, such as depth to groundwater since high groundwater levels could prevent effective infiltration.

Much of Blackpool has superficial deposits of Till which is indicated as Unproductive Strata (i.e. non aquifer). In these areas, the low permeability of the overlying Till layer may prevent infiltration SUDS being feasible, even

[10] It is unlikely that there will be high levels of nitrates in surface water runoff, but there can be nitrogenous waste in plants (e.g. leaves) which can be nitrified into nitrates. This is considered a low risk, and well designed SUDS, which include a treatment element, should mitigate this risk.

where the bedrock is more permeable. In these areas therefore, attenuation based SUDS will generally be more applicable.

The more permeable sites should have priority given to infiltration drainage techniques, as opposed to discharging surface water to watercourses. Where less permeability is found and infiltration techniques that rely on discharge into the existing soils are not viable (also due to a high water table, source protection zones, contamination etc), discharging site runoff to watercourses is preferable to the use of sewers. Integrated urban drainage should also be used throughout the design process and early consultation with Blackpool Borough Council and the Environment Agency is essential for all development sites to identify the types of SUDS likely to be applicable.

There are no nitrate vulnerable zones in the Blackpool area. However, watercourses may drain through such a zone further downstream so it is recommended that developers should assess the risk of nitrates in surface water entering the watercourse[11], and also into the sea as in some cases, a site's proximity to the coast may mean it is more reasonable to discharge directly into the sea.

There are no SPZ areas within Blackpool.

A further factor to take into account is where a site lies within flood zone 2 or 3. As a general rule, SUDS should be built outside of flood zone 2 and 3 as a preference, or up to the 100 year event plus climate change as a minimum. If SUDS are constructed in areas of flood risk there is a possibility the river could flood the SUDS features, thus reducing their capacity and ability to perform their drainage function properly.

5.7 Surface Water Runoff for developments

For major developments (over 500 houses) without planning permission or where a planning application had not been received potential surface water runoff and storage areas that may be required have been calculated (see Table 5-14). The analysis was undertaken for developments that do not already have planning permission or a planning application submitted as it was assumed that a more detailed analysis of volumes required has already been by the developer as part of any planning application already submitted.

Site Reference	Drainage Area (ha)	100 year Attenuation Storage (m^3)	Attenuation Storage per hectare of development (m^3)	Long Term Storage (m^3)	Long Term Storage per hectare of Development (m^3)	100 year Greenfield Rate (l/s)	100 year Greenfield Rate per hectare of development (l/s)	Max. Long Term Storage Discharge Rate (l/s)
SS/052	52	20100	390	12900	250	90	2	100
SS/053	65	25200	390	16000	250	110	2	130
BUV01	44	19200	440	6900	160	660	15	90
BUV02	93	40600	440	14600	160	1300	14	190

[11] It is unlikely that there will be high levels of nitrates in surface water runoff, but there can be nitrogenous waste in plants (e.g. leaves) which can be nitrified into nitrates. This is considered a low risk, and well designed SUDS, which include a treatment element, should mitigate this risk.

Site Reference	Drainage Area (ha)	100 year Attenuation Storage (m^3)	Attenuation Storage per hectare of development (m^3)	Long Term Storage (m^3)	Long Term Storage per hectare of Development (m^3)	100 year Greenfield Rate (l/s)	100 year Greenfield Rate per hectare of development (l/s)	Max. Long Term Storage Discharge Rate (l/s)
PO01	56	19200	340	7700	140	630	11	110
PO71	84	30500	360	11500	140	950	11	170
Lightfoot1	73	26500	360	10000	140	610	8	150
FW3	101	37400	370	13900	140	1040	10	200
MS2	40	14600	360	5500	140	220	6	80
Central Lancs Village	101	37400	370	13900	140	1040	10	200

Table 5-14 Surface water volume and peak flow requirements for major development areas (over 500 houses) where a planning application has not been submitted

The following assumptions/points should be noted:

- The calculation method has followed the joint Defra/Environment Agency R&D Technical Report 'Preliminary rainfall runoff management for developments' (Environment Agency 2007). This method provides initial, conservative estimates of the increase in peak flow and volume runoff from proposed developments.

- It has been assumed that the whole of the site area will be developed. Since the overall proportion of development is unknown, a 75% development of the area has been assumed. The calculated storage volumes provide conservative estimates.

- The Greenfield runoff rates, attenuation and long term storage volumes provided in the attached table are based on the 100 year, 6 hour storm event as per the Defra guidance (EA, 2007).

- Developers are required to provide both attenuation and long-term storage. The long-term storage volume is the portion of the total attenuation storage for which the discharge rate must not exceed 2l/s/ha. The discharge rate for the remainder of the attenuation storage must not exceed the greenfield runoff. For example for site SS/052 12,900m^3 must function as long term storage, discharging at a maximum of 2l/s/ha (104l/s). Discharge of the remaining 7200m^3 (which is the 100 year attenuation storage minus the long term storage) must not exceed 90l/s.

- The recommended climate change factor that has been used. This is relevant to the Defra guidance produced in 2007, however it should perhaps be amended by the developers at the detailed design stage so that they are more in line with PPS25 where climate change factors for surface water runoff are based on a percentage increase to rainfall intensity and based on the design life of the development.

- These values in Table 5-14 do not include an allowance for water quality treatment, and hence the actual storage requirements on site may be greater depending on the need to improve the quality of runoff discharging to groundwater or watercourses.

- It is important to stress that the calculations are outline figures and should be re-assessed at the detailed design stage based on further knowledge of developable area.

5.8 Site Specific SUDS analysis

For each of the development sites a high level assessment of the surface water drainage requirements has been carried out. At this stage, the assessment has included the location of nearest watercourses (which is important for assessing the potential to discharge to a watercourse if required), SPZs, and an overall assessment of the suitability of different SUDS approaches based on the geology and aquifer classification. The results from this assessment are presented in Appendix B.

For each developments site, the factors noted in the table in Appendix B require the following consideration:

- If a site is within an area which has been classified as a NVZ for groundwater, there is a risk that infiltration SUDS could mobilise existing pollutants within the soil and increase nitrate levels within groundwater. A more detailed assessment of the risk of nitrate pollution of the groundwater should be undertaken as part of any development proposals.

- If a site lies within a NVZ for surface water, any surface water drainage connections to watercourses should be assessed to understand the risk of nitrate pollution of watercourses.

- As a general rule, infiltration SUDS will not be applicable within SPZ 1 because of the risk of groundwater pollution. Some infiltration of roof runoff may be possible, subject to the constraints identified in Table 8 8. The area in SPZ 2 is at lower risk of polluting groundwater sources, but some additional SUDS treatment might be required where infiltration approaches are used.

- Infiltration SUDS should be prioritised, where practicable. However, it is recognised that because of the low permeability Till which underlies much of the study area, many sites may not be able to infiltrate. A site specific infiltration test should be used to check this, also, if the Till layer is not too deep it may be possible to locate the infiltration SUDS below it, depending on water quality vulnerability.

- Where infiltration is not possible, many of the sites were found to be within 0.5km of a watercourse, such that discharge of surface water runoff to a watercourse should be easily manageable. Some sites, however, are over 1km from the nearest watercourse, which may present a constraint to discharging surface water runoff into a watercourse.

- For smaller scale developments, source and site control measures are more likely to be applicable at these sites.

- For larger scale developments, a regional approach to managing surface water may offer cost-savings and efficiencies through use of larger SUDS features (e.g. wetlands), rather than a series of smaller scale feature. Under the forthcoming Floods and Water Management Bill the Councils will be responsible for the approval, adoption and maintenance of new build SUDS.

5.9 Windfall development

Due to the nature of windfall development, there is no indication of specific locations which might come forward for windfall development at this stage, and thus it is not possible to look at potential site specific surface water drainage requirements. However, it is possible to identify surface water drainage requirements which should be adopted when windfall developments come forward.

The following hierarchy should be adopted to manage surface water runoff from windfall development;

- where possible, infiltrate runoff using infiltration SUDS;

- where this is not possible discharge to watercourse in close consultation with the Environment Agency to ensure no increase in downstream flood risk, and;

- as a last resort connect to the public sewer system, in close consultation with United Utilities.

In brownfield sites, development should seek to better existing runoff rates and volumes where possible, in agreement with the Environment Agency and the Local Planning Authority Land Drainage Officer.

5.10 Conclusions and recommendations

The assessment of the suitability of different types of SUDS has identified where infiltration or attenuation SUDS approaches may be more applicable based on geology, groundwater vulnerability (i.e. aquifer) and source protection zones.

For large development sites where a planning application has not been received, an assessment has been undertaken of the surface water drainage requirements to ensure runoff rates and volumes from the developed site are no greater than greenfield runoff rates and volumes. The analysis indicates less than 1% of the developable land will be taken up by the requirements to attenuate surface water runoff, and these requirements are not considered a constraint to development.

In general, any development (including developments in Low Probability Flood Zone 1) which does not incorporate SUDS may increase the risk of surface and/or fluvial flooding both on-site and off-site (downstream). As such effective planning policies should be implemented in accordance with the SUDS recommendations provided in this report. The following recommendations are made in light of the findings of the outline WCS:

- As a minimum runoff rates and volumes from the development site should not be greater than runoff rates and volumes prior to development up to the 100 year 6 hour rainfall event (plus an allowance for climate change). In brownfield development sites a reduction of runoff rates and volumes should be achieved compared to the existing rates and volumes. The runoff requirements for a development site should be agreed with the Environment Agency at an early stage in the planning process

- SUDS should be promoted at all scales of development. At the household level there should be a presumption away from connecting property extensions or additional hard-standing area to the sewerage network. The additional runoff should be managed at source, where possible, or connected to a watercourse (in agreement with the Environment Agency).

- Infiltration SUDS should be promoted where it is practical. Where infiltration SUDS are not applicable surface water should be discharged to a watercourse (in agreement with the Environment Agency) at a rate no greater than greenfield.

- Where infiltration SUDS are proposed, this must be supported by a groundwater risk assessment, carried out by the developer, to ensure groundwater is not polluted. Groundwater flooding should also be considered where infiltration SUDS are proposed. The presence of Nitrate Vulnerable Zones (NVZs) must also be considered as part of the development proposal.

- Surface water should not be connected to the sewerage network..

- Where surface water will be connected to a watercourse, early consideration should be given to the proposed route to connect to the watercourse. Developers should work closely with the SUDS Approving Body at an early stage of the planning application to understand surface water routes to connect to a watercourse and the potential land ownership issues.

- Where a development area contains several sites under different developers, there are more opportunities to strategically plan the provision of surface water drainage infrastructure, to ensure runoff rates and volumes are not greater than existing across the whole of the area. For example, it may be possible to design an attenuation basin which can store runoff across the whole of the development area, and it is considered that this would be easier to operate and maintain compared to lots of smaller attenuation SUDS on separate sites. Given that Lancashire County Council, as the SUDS Approving Body, will need to adopt and maintain new build SUDS under the proposed Floods and Water Management Bill, a regional approach to SUDS may result in cost and efficiency savings. This would require early co-ordination and planning by theCouncil and it is recommended that a strategic surface water master plan[12] is developed to consider the possibilities and opportunities for the production of a strategic surface water drainage system.

- In greenfield developments there should be no flooding (from all sources) on properties up to the 100 year flood event with climate change. This can be achieved through effective master planning

[12] This site may not require a full Surface Water Management Plan, as defined by Defra, but some strategic surface water master planning is recommended.

of the development site, and should include an allowance for managing exceedance flows13 if surface water drainage infrastructure is exceeded. In brownfield development it may not be possible to achieve this level of protection depending on the nature of the existing risk, but there should be a presumption against building in areas of high risk

- Runoff which is likely to be heavily contaminated must be treated by a proprietary device, which should be carefully considered to ensure the correct system is selected to remove pollutants. PPS23: Planning and Pollution Control (2004) discusses the requirements to consider the implications of contaminated land and pollution as a material planning consideration. For example; the drainage system for a car park should incorporate a filter bed wherever possible before considering an interceptor device to remove contaminants.

- If the local soil is contaminated then a lined system is generally required. This may include a drainage design which allows infiltration in the upper layer, but should incorporate an impermeable layer at its base to prevent contamination. In such cases lined underground attenuation storage is used to store a 1 in 100 year plus climate change storm event and discharges into a nearby watercourse.

[13] Guidance of managing exceedance flows is provided in "Designing for Exceedance in urban drainage – good practice C635, CIRIA, 2006)

6 Assessment of Water Resources

6.1 Overview

The WCS has collated the latest information on water resources from United Utilities Final Water Resource Management Plan (WRMP) to identify significant water resource constraints across the study area. Further scenarios have also been examined, and a framework has been identified towards more sustainable use of water resources.

United Utilities (UU) released its final Water Resources Management Plan (WRMP09) in September 2009. The information within this WCS and the Demand Scenarios examined are based upon the information provided within the final WRMP09.

6.2 United Utilities' Water Resource Strategy

6.2.1 Current

UU currently serves a population of 6,535,000 of which 95% live within the Integrated WRZ. WRZ's are further divided into demand monitoring zones (DMZ) and further into district meter areas (DMA). Through consultation with customers, regulators, stakeholders and balanced with the needs of the environment, UU has identified that the optimum level of service for water supply reliability should be based upon hosepipe bans and drought orders to augment supplies once in 20 years. The Final WRMP has been based upon delivery of this standard.

Investment during previous AMP periods has resulted in improvements over the last decade or so to the water supply system and its security in the Integrated WRZ. UU has undertaken several large projects to refurbish parts of the aqueduct system, built new pipelines and have carried out major investment at many water treatment works to improve the quality and security of water supplies.

UU is currently planning the construction of another new bi-directional pipeline, known as the "West-to-East Link", between Merseyside and North Manchester. It is due to be in operation by 2011. This will help maintain adequate supplies to Greater Manchester or Merseyside in the event of needing to temporarily reduce supply from a major reservoir, for example due to maintenance work or drought conditions. This will be an enhancement to the supply network to further increase the integration and flexibility of the supply within the Integrated Zone. In addition to security of supply, the "West-to-East Link" will enable UU to deliver two further projects that currently present a major challenge, which involve the inspection and maintenance of some of our large diameter trunk mains. Without the link in place, UU would be required to construct duplicate mains, which would subsequently become large redundant assets, or else water supplies would be placed at high risk during internal inspection of the mains.

Table 6-1 outlines the current situation (2009/10) and the situation used as the baseline year for assessment purposes (2006/07).

Description	UNITS	Scenario Year 2006-07	2009-10
Deployable Output	Ml/d	2147.52	2116.34
Potable Water Imported	Ml/d	0.04	0.04
Potable Water Exported	Ml/d	0.12	0.12
Total Water Available for Use (WAFU)	Ml/d	1931.73	1904.64
Unmeasured Household - Population	000's	5186.421	4802.132
Measured Household - Population	000's	1224.875	1648.261
Unmeasured Household - PCC	l/h/d	154.15	154.49
Measured Household - PCC	l/h/d	130.03	125.56
Total Leakage	Ml/d	442.44	441.90
Supply-Demand Balance	Ml/d	16.60	50.60

Table 6-1: Information from UU final Dry Year WRMP09 Tables

Metering and Demand Management Measures

Metering by 2006/07 included 21% of UU's household customers and 87% of non-household customers. UU's current policy on metering includes metering of all new households and non-household properties, provision of a free meter option for existing households and metering of existing unmeasured non-households properties where practical. The baseline assumption is that the current policy will continue and this will achieve a penetration of 60% of households by 2035. UU estimates that metering reduces consumption by households by 8.3% in a normal weather year.

As well as metering a number of consumer demand management activities are currently employed by UU including the following:

- Free cistern displacement devices;
- Issuing of self-audit packs and water information packs;
- Discounted water butts;
- Promoting water efficiency to parks and gardens through a water efficiency leaflet campaign;.
- Numerous education programs; and
- Investigation novel techniques for water reduction.

From 2010 UU is planning to substantially increase its water efficiency programme which includes providing free water savers' packs, self-audit packs, cistern devices and other water saving measures to customers. This will include a free water savings pack and cistern device for all newly metered households, and free audits for institutional customers such as schools and hospitals. The programme will enable UU to achieve the recently introduced mandatory water efficiency targets (Ofwat, 2008), which sets a target saving of 2.95 Ml/d each year by UU (although the water savings achieved will decay as customers remove or replace devices over time). In addition, UU is planning a water efficiency research programme in 2010-15, as part of their water demand reduction strategy.

Leakage

UU has significantly reduced leakage over the last 15 years, more than halving leakage from 960 Ml/d in 1992/93 to 468 Ml/d at 2006/07 (462 Ml/d at 2007/08). This has been achieved through the following activities:

- Employing best industry practice;
- Extensive District Meter Area (DMA) Coverage (99% of properties are covered by continuous monitoring);
- Widespread Pressure Management (59% of the region is pressure controlled);
- Good quality leakage data and Information systems;
- Efficient leakage detection using latest technologies;
- Reduced repair times;
- Mains replacement and refurbishment;
- Providing free supply pipe repairs for domestic customers;
- Leakage detection and repair service for commercial/industrial customers.

In the Integrated WRZ total actual leakage in 2006/07 was 442.4Ml/d this is reduced to 441.9Ml/d from 2008/09 onwards. Leakage in the Integrated WRZ is currently estimated at 24% of treated water (distribution input).

In the Integrated WRZ future total volume of supply pipe leakage is forecast to rise by 19% from 63 Ml/d in 2006/07 to 75 Ml/d in 2034/35 due to the increasing number of connections, but this is less than the 21% expected increase in the number of household and non-household properties served. UU's baseline demand management plan assumes leakage levels will be maintained at current levels.

6.2.2 Baseline Forecast

In producing the final WRMP09, UU has looked at the current supply-demand balance and predicted the future supply-demand balance. The planning scenario addressed is a dry year annual average supply-demand scenario as prescribed within the EA's Water Resource Planning Guidelines (WRPG). This baseline scenario demonstrates what the supply-demand outlook would be based on UU's projected changes to future demand and water available for use (WAFU), assuming no change to current AMP4 demand management and leakage policies, and depicts a hypothetical situation where every year is dry year up to 2035 with unrestricted demand. The baseline and forecast DO from the Integrated WRZ which serves the study area can be found in Table 6-2. The forecast reduction in DO is due to climate change and sustainability reductions. Further reductions in DO may occur due to the Water Framework Directive, however at the time of writing the final WRMP the Environment Agency had not advised what these would be.

Baseline DO (Ml/d) (2006/07)	DO at 2020/21 (Ml/d)	DO at 2034/35 (Ml/d)
2147.52	2114.89	2108.22

Table 6-2: Baseline and Forecast Deployable Output (final WRMP09)

Climate Change

In forecasting future baseline DOs and demand within the final WRMP09 UU have factored the possible impacts of climate change as per detailed guidance provided by UKWIR (2006 and 2007) and EA(2008). UU expects climate change to significantly impact on future water resource yields. Table 6-3 shows the predicted impact of climate change on Deployable Output.

Impact on DO (Ml/d) (2006/07)	Impact on DO (Ml/d) (2014/15)	Impact on DO (Ml/d) (2024/25)	Impact on DO (Ml/d) (2034/35)
0	-11.9	-23.4	-28.1

Table 6-3: Estimated impact of climate change on deployable output (negative values indicate a reduction in DO).

Sustainable Abstraction

The EA's programme, Restoring Sustainable Abstraction (RSA), will impact upon future DO. The aim of the programme is to investigate impacts on the environment due to abstractions of water, and where such impacts arise, the possible reduction of the abstractions or other mitigating schemes. Potential reductions have been incorporated into UU's baseline planning assumptions for the final WRMP09. In the Integrated WRZ the sustainability reductions will result in an anticipated 32.9Ml/d reduction in DO over the planning period which will affect the Haweswater intake, Thirlmere Reservoir and abstractions from the Rivers Brennand and Whitendale due to their status under the Habitats Regulations or due to designations as Sites of Special Scientific Interest (SSSI).

Population, Housing Growth and Consumption

In forecasting water demand population estimates are derived from official data from the Office of National Statistics (ONS) using the best available methods, in accordance with OFWAT reporting requirements. The total population supplied by UU is expected to increase between 2006/07 to 2034/35 by 13%.

Original forecasts for housing growth were based upon those in the RSS. This was compared to more recent data available from local councils and the RSS figures were used for a more cautious approach. The growth points as announced by the Department for Communities and Local Government were also used and these were phased into the population forecasts.

Between the publication of the draft WRMP in 2008 and the final in September 2009 more evidence of the effect of the economic downtown became evident. In the final WRMP UU has assumed that the number of new homes built in 2009/10 will be half of the current level (as defined it the UU WRMP and in line with statements by the National house-building council) and that the numbers will gradually return to recent historic levels by 2014/15. UU has also assumed that the National Housing and Planning Advice Unit forecast for 2026 is delayed by 5 years until 2031. This predicted an average increase in homes of 26,600 per annum between 2003 and 2026. The final WRMP shows that UU expects the number of households served to increase by 22% from the 2006/07 level to 2.94 million to 3.58 million by 2034/35. Table 6-4 provides a summary of predicted housing growth.

Basis of forecast	2003 (actual)	2007	2016 (forecast)	2021 (forecast)	2026 (forecast)	2031 (forecast)
Regional spatial strategy (23,111 p.a. from 2003)	2874	2966 (forecast)	3174	3290	N/A	N/A
National Housing and Planning Advice Unit (26,600 p.a. from 2003)	2874	2980 (forecast)	3220	3353	3486	N/A
UU forecast (for the whole of UU region)	2874	2945 (actual)	3093	3224	3355	3486

Table 6-4: Comparison of policy-based housing projections for the North West Region ('000).

Note: UU's water supply area is slightly different to the North West Region and so the housing forecasts used in the WRMP are slightly different to those shown above.

The average household occupancy has also been steadily decreasing across the UU supply area in recent decades and it is expected to reduce further from 2.32 in 2006/07 to 2.15 by 2034/35 (including empty homes). Using data gathered from customer surveys UU has estimated that the occupancy rate of unmeasured houses is 2.44, of new measured households is 2.62 and of meter optant house (those that have chosen to be metered) is 1.70 in 2006/07.

For the Integrated WRZ household populations and water consumption have been predicted to change over the forecast period as shown in Table 6-5.

Unmeasured			Measured		
Population Numbers			Population Numbers		
Household consumption Ml/d			Household consumption Ml/d		
2006/07	2014/15	2034/35	2006/07	2014/15	2034/35
5,186,421	4,359,333	2,840,627	1,224,875	2,257,746	4,405,302
799.47	668.60	467.02	159.27	286.84	580.57

Table 6-5: Population and Consumption for Unmeasured and Measured Households

The significant increase in measured household consumption is due to the estimated number of new properties that will be built in the North West Region by 2034/35.

Outage and Water Available for Use (WAFU)

Outages were calculated using the best practice methodology published by UKWIR and has considered previous experiences of actual losses due to planned and unplanned events and an assessment of the risks of unplanned events occurring in the future. The resulting impact on WAFU in the Integrated WRZ is shown in Table 6-6.

Year	Baseline DO (Ml/d)	Outage (Ml/d)	Process Loss (Ml/d)	WAFU (Ml/d)
2006/07	2147.52	55.30	60.81	2031.41
2014/15	2124.43	64.80	57.22	1969.52
2034/35	2108.22	64.80	57.22	1953.31

Table 6-6: Baseline Water Available for Use in the Integrated WRZ

Whilst outage and process losses are predicted to remain constant throughout the planning period the Baseline DO is impacted by sustainability reductions, the East-West Link that will come into use from 2011 and climate change. The sources of the reductions in the baseline DO for the Integrated WRZ are not detailed in the final WRMP but are provided to the Environment Agency separately. Given that the EA has a role in auditing the WRMP it is assumed that the EA is comfortable with UU's prediction in reductions in DO and therefore the figures for WAFU are accurate.

Target Headroom

Target headroom is the minimum buffer planned between WAFU and demand, and caters for uncertainties within the supply-demand scenario. Target headroom has been derived by UU using best practice methods for each WRZ. However there remain some uncertainties regarding the impact of the WFD upon existing and future licence abstractions which UU has not been allowed to include in their assessment of target headroom. This presents a significant risk to the certainty of future DO in each WRZ.

In line with the present methodology UU has applied a varying level of headroom over the planning horizon with a lower level of risk in present years of 5% up to 2009/10 and a higher level of risk in future years, with the risk increasing to 30% by 2034/35. For climate change a 50% risk profile has been applied throughout the planning period. The values are summarised in Table 6-7 for the region.

	2006/07	2009/10	2014/15	2019/20	2024/25	2034/35
Non-climate change risk of underestimating the supply-demand balance	-	5%	15%	25%	30%	30%
Climate change risk of underestimating the supply-demand balance	-	50%	50%	50%	50%	50%
Integrated WRZ – Target Headroom (Ml/d)	41.4	53.4	79.3	99.0	106.0	129.5
Integrated Zone – target headroom as % of WAFU	2.1%	2.8%	4.2%	5.3%	5.7%	6.9%
Integrated Zone - Contribution of climate change to target headroom value (Ml/d)	0	10.3	35.5	60.9	70.9	84.9

Table 6-7: Summary of impact of climate change and target headroom.

Note: The 2006/07 values for target headroom are those reported in the 2004 WRMP. The future values have been calculated based on the 2007 target headroom assessment.

The calculated target headroom value for the Integrated Resource Zone is low at 2009/10 at only 2.8% of reliable supply (WAFU). Target headroom increases to 4.2% of WAFU at 2014/15 and 6.9% of WAFU at 2034/35, increasing primarily due to the increasing uncertainties in climate change impacts on the water sources, due to the large number of reservoirs that are part of the supply system for the zone and water demand.

6.2.3 Supply-Demand Balance

The baseline scenario as shown by UU within the final WRMP09 describes the supply-demand outlook based on projected changes to future demand and water available for use. It assumes a hypothetical situation where every year up to 2035 is a dry year with unrestricted demand and no changes to current demand management and leakage policies, with resources, outage and headroom determined by a probabilistic approach. The equation is given by:

Supply-demand balance = Water Available for Use – Dry weather demand – target headroom.

The Final WRMP09 shows that the supply-demand balance remains positive for the Integrated WRZ until 2022/23 when the shortfall amounts to 0.94Ml/d. This deficit increases to 74.61Ml/d by 2034/35, assuming the proposed level of service is met. The supply-demand balance assumes the following apply throughout the planning period:

- Continuation of existing leakage control policies to maintain regional total leakage below 465 Ml/d.
- Continuation of existing water efficiency activities.

- Continue to meter all new properties.
- Continuation of the free meter option scheme.
- Continue with existing tariff structures for water bills.

Table 6-8 shows the supply-demand balance for the WRZ and the factors affecting it.

	2006/07	2009/10	2014/15	2019/2020	2024/25	2034/35
Water Source Yield (Ml/d) (WAFU)	1931.7	1904.6	1879.8	1871.3	1868.4	1863.6
Dry weather Demand (Ml/d)	1873.8	1800.7	1770.60	1765.4	1769.5	1808.7
Target Headroom (Ml/d)	41.4	53.4	79.3	99.0	106.0	129.5
Supply-demand balance (Ml/d)	16.6	50.6	30.00	6.9	-7.1 (deficit)	-74.6 (deficit)

Table 6-8: Supply-demand balance for the Integrated WRZ

Within the Integrated WRZ the WAFU is expected to reduce by 24.8Ml/d between 2009/10 and 2014/15, however due to the introduction of the West-to-East Link main there will be an increase in 2012/13 of 16.6Ml/d. The sustainability reductions which come into effect in 2014/15 will lead to significant reduction of 32.9Ml/d arising from proposed abstractions licence changes for several sources. Coupled with the reduction in supply due to these impacts there is also an increase in target headroom requirements over time due to increasing uncertainties, particularly surrounding climate change.

A program of supply-demand solutions will be required from 2022/23 onwards to maintain water supply reliability and the preferred level of service within the WRZ.

6.2.4 UU Preferred Plan to Balance Supply and Demand

UU has developed a baseline plan and an enhanced plan to maintain supplies until 2034/35. The baseline plans for already planned activities which include:

- Construction of a bi-directional pipeline, known as the "West-to-East Link", between Merseyside and North Manchester. It is due to be in operation by 2011.
- Maintain current leakage levels.
- Reduce demand by 9 Ml/d by 2014/15 (increasing later on to 12 Ml/d), through the water efficiency programme.
- Water demand reduction of 10 Ml/d by 2014/15 (increasing to 22 Ml/d by 2034/35) by the household customers that are expected to opt to be metered.

- Non-household customers are expected to reduce water demand by 90 Ml/d by 2014/15 (141 Ml/d by 2034/35) due to the effects of the economic downturn and as part of continuing water efficiency programmes, which will be encouraged by UU's activities to promote water efficiency.

To manage the supply-demand balance over time UU's WRMP09 has identified and evaluated a range of potential investment options to manage projected supply-demand deficits. These options are grouped under:

- Customer demand management.
- Distribution demand management.
- Production management.
- Resource management.

An unconstrained list was produced which following an initial assessment identified those feasible options which have been taken forward for more detailed examination. These options have been ranked based upon the average incremental social cost (pence per cubic metre of water). The options that were taken forward to form part of the preferred "enhanced plan" are shown in Table 6-9.

Previous consultation has identified that a new reservoir at Borrowbeck in the Lune Valley or raising dams or reservoirs is unlikely to be promotable and therefore these options do not form part of UU's preferred plan. A deficit is not present until 2022/23 and until 2025 this can be addressed by leakage reduction and water efficiency measures. From 2025 UU has identified the requirement for some enhancement to groundwater supplies to meet the deficit.

The enhanced plans can be summarised as:

- Further reducing leakage by 23 Ml/d by 2034/25.
- A programme of economic water efficiency measures to save 4 Ml/d by 2034/35.
- Implementing water source enhancement of 48 Ml/d by 2034/35.

UU is also planning to undertake a research programme during 2010-15 to investigate further leakage reduction and water efficiency measures. Although not required in this timeframe to maintain an adequate supply-demand balance, UU has identified that research studies are important to identify more cost-effective measures for implementation in the future.

No alternative combinations have been considered at this time as the measures are not required until 2022/23 and there will be significant changes in the next few years due to the implementation of the Water Framework Directive which will be incorporated into future WRMPs in 2014 and 2019.

Option	Water saving (Ml/d)	AISC (p/m3)	Benefit to supply-demand balance		
			2024/25	2029/30	2034/35
Deficit requiring solutions			7.1	32.3	74.6
Water efficiency research	0.09	243.4	<0.1	<0.1	<0.1
Water efficient shower heads	1.99	2.16	0	1.0	1.5
Domestic "visit and fix" – meter fitting add on	2.55	41.9	0	0	2.5
Water efficiency total			<0.1	1.0	4.0
Pressure reduction stage 1	1.0	4.4	0	0	1.5
Pressure reduction stage 2	0.5	37.4			
Leakage Detection Stage 1	10	28.7	7.1	8.6	10
Leakage Detection stage 2	10	34.3	0	0	10
Leakage detection stage 3	10	42.3	0	0	1.3
Leakage reduction total			7.1	8.6	22.8
Widnes Groundwater	22.7	23.9	0	22.7	22.7
Southport Groundwater	22.5	31.2	0	0	22.5
Oldham Groundwater	2.5	29.6	0	0	2.5
Supply enhancement total			0	22.7	47.7
Total benefit to supply-demand balance (Ml/d)			7.1	32.3	74.6

Table 6-9: List of feasible options which form part of UU's preferred plan.

Note: The average incremental social cost (AISC) of an option includes environmental, social and financial costs. WAFU benefit for water efficiency options is the maximum over 25 years.

6.2.5 Conclusion of UU's Final WRMP09

In summary, the assessment of UU's final WRMP indicates that:

- the Integrated WRZ currently has a surplus of supply compared to demand;
- there will be a deficit in the supply-demand balance from 2022/23 onwards;
- the available water (also known as deployable output) is predicted to deteriorate over the planning period due to climate change and sustainability reductions; and
- there are significant uncertainties surrounding the implementation of the Water Framework Directive and climate change.

UU's proposed measures as part of its baseline and enhanced plan will help to address the shortfall.

6.3 Future Demand

All the analysis within UU's WRMP undergoes a rigorous testing and review process with Defra, Ofwat and the Environment Agency, as well as public consultation. The assumptions made by UU have been stated above. The water company has a statutory requirement to supply water to a specific level of service. The way that it is regulated means that it cannot rely on promises by developers or local authorities to manage demand; therefore the water company planning process tends to take a conservative approach to predicting future demand. Hence, the per capita consumption (PCC) scenarios used by UU in its demand assessment does not look at more aspirational demand management scenarios that can only be achieved with strong planning policies.

The Office of National Statistics (ONS) publishes mid-year population estimates for local authority areas on an annual basis. The most recent data is for 2008 which has been used to estimate the current WRZ and WCS area populations.

The Blackpool and Central Lancashire WCS study area lies solely within the Integrated WRZ. The proportion of current WCS area populations within the WRZ has been estimated using the ONS lower-layer super output area (LSOA) population data. The LSOA data, which is consistent with the ONS published district population totals, allows a population-based determination of the proportion of a district that lies within a specific water resource zone; this is more accurate than the commonly used method of deriving a population estimate based on the relative geographical areas. The most recent LSOA data, for 2008, has been used to assess the proportions of the 2008 local authority area populations within the resource zone.

The 2008 population for the Integrated WRZ is identified by UU as 6,566,407. Data from the Office of National Statistics (ONS) records a population of 6,391,271 for the WRZ. There is less than 5% difference between these two sets of data and therefore the population figures provided from UU are considered to be correct. The population of the water cycle study areas has been calculated from the ONS data to be 141,916 for Blackpool and 344,003 for Central Lancashire. The population of Blackpool represents less than 3% of the total WRZ population and the population of Central Lancashire represents less than 6%.

As the Integrated WRZ supplies a large number of people and covers such a wide geographical area there are many sources of supply available to UU and the size of the zone provides a great amount of flexibility in moving resources around within it. The introduction of the West-to-East Link from 2011 will increase this flexibility further.

Estimations for proposed new properties for the WCS area have been provided and are summarised in Table 6-10. The numbers of completions from 2006/07 to 2010/11 have been taken from the Blackpool Core Strategy and the Central Lancashire SHLAA which provide a total figure for completions between 2003-2010, these figures have been divided equally between the 7 years to obtain and average per year and then this average has been applied to the 5 years period for 2006/07-2010/11. The estimated number of proposed properties from 2011-2026 has been provided by each local authority. This has been divided equally across the years to obtain an average per year which has then been applied to the additional 9 years beyond the planning horizon but which is considered n the WRMP (from 2026/27 to 2034/35). This therefore assumes that same rate of growth will apply beyond 2026 as what applied between 2011-2026. Using the data in the WRMP and 2006/07 as the baseline scenario year the total number of existing household properties (measured and unmeasured) is calculated by UU to be 2,643,106. By 2034/35 this is estimated by UU to be 3,277,033 representing an increase of 633,927 in household properties. Using the figures below the number of new houses in the Blackpool area to be built between 2006 and 2035 will represent less than 2% of the total new households in the Integrated WRZ. The new houses in the Central Lancashire region between 2006 and 2035 will represent less than 7% of the total new households to be built in the Integrated WRZ.

Local Authority	Completions 06/07-10/11	No. of properties from 2011-2026	No of properties between 2027-2035 (assuming same rate of growth)	Total number of new properties from 2006-2035
Central Lancashire	6205	22965	13779	42949
Blackpool	1430	5364	3218	10012

Table 6-10: Summary of proposed housing projections during the WRMP planning period.

The population of the study areas of the WCS represents a small proportion of the total population for the WRZ. The number of new households estimated between 2006 and 2035 represents a small proportion of the total number of new households in the Integrated WRZ as a whole. Thus any additional demand for water from new properties in the Blackpool and Central Lancashire areas in future will represent only a very small proportion of the total demand for the WRZ.

6.4 Recommendations

Given that the Final WRMP09 produced by UU has undergone a rigorous testing and review process with Defra, Ofwat and the Environment Agency, as well as public consultation it can be assumed that all these organisations are satisfied with the measures UU are proposing in the plan. UU does not predict a supply-demand deficit for the Integrated WRZ until 2022/23 which is based on the assumptions listed above for their baseline plan. Of these assumptions two relate to household demand as follows;

- Reduce demand by 9 Ml/d by 2014/15 (increasing later on to 12 Ml/d), through the water efficiency programme.

- Water demand reduction of 10 Ml/d by 2014/15 (increasing to 22 Ml/d by 2034/35) by the household customers that are expected to opt to be metered.

These measures require actions by UU, however as the Integrated Resource Zone is due to go into deficit in 2023, it would be prudent to recommend that water efficiency is considered in planning policies given that local authorities have a duty to take steps wherever practicable to encourage the conservation of water and to help reduce consumption rather than relaying soley on UU to tackle water efficiency. Those producing policies should also be mindful of the Government's Building a Greener Future policy Statement (CLG, 2007) which may in future require new homes to achieve a certain CSH level, although with the recent regime change and uncertainty surrounding how and when this will be achieved it may not be necessary to include this in policies now but be aware that policies may need to be amended in future to support Government policy. It is therefore recommended that all new homes are built to the CSH level 3 (105 litres per person per day). For non-residential developments it is recommended that they aim to achieve BREEAM "excellent" standard. Efficiency measures also have the potential to reduce the carbon footprint of the water supply / use / disposal system.

Central Lancashire

The draft policy for the Central Lancashire Preferred Core Strategy has been provided, this Policy 29 in Publication Core Strategy "Water Management" in its' explanation of the policy in relation to use of water resources states "Improve water quality, water management and reduce the risk of flooding by:

(a) Minimising the use of potable mains water in new developments;

(b) Working with the regional water company and other partners to promote investment in sewage water treatment works to reduce the risk of river pollution from sewage discharges;

(c) Working with farmers to reduce run-off polluted with agricultural residues into watercourses;

(d) Appraising, managing and reducing flood risk in all new developments, avoiding development in high flood risk areas wherever possible and appropriate, particularly in vulnerable parts of Croston, Penwortham, Walton-le-Dale and southwest Preston;

(e) Pursuing opportunities to improve the sewer infrastructure, particularly in Grimsargh, Walton-le-Dale and Euxton, due to the risk of sewer flooding;

(f) Managing the capacity and timing of development to avoid exceeding sewer infrastructure capacity;

(g) Encouraging the adoption of Sustainable Drainage Systems;

(h) Seeking to maximise the potential of Green Infrastructure to contribute to flood relief.

The first bullet point in the policy above fulfils the duty to promote water efficiency however this is not translated into the actual policy itself which does not specifically mention water efficiency or use of water resources. It is therefore recommended that policies include promotion of water efficiency but are not necessarily restricted to achieving certain levels of CSH at the present time.

Blackpool

The Blackpool Core Strategy Preferred Option, November 2010 recognises that "Sustainable natural resource management within Blackpool means ensuring greater efficiency in our use of natural resources,". However this is stated in relation to Policy S7 "Climate Change and Sustainable Development" and Policy M5 "Neighbourhood Character, Marton Moss/ M5 hub" which do then not specifically make reference to water efficiency measures. It is debatable whether this fulfils the duty to promote water efficiency and it is therefore recommended that in the short-term policies are updated to include specific mention of the promotion of water efficiency. It is not necessary to restrict new development to achieving certain levels of CSH at the present time but policy makers should again be mindful of the Government's Building a Greener Future Policy and potential changes to the Building Regulations which may require policy to be updated and strengthen in the medium to long term.

6.5 Conclusions

The Final WRMP09 produced by UU provides a robust plan for addressing future supply-demand balances in the North-west region. The majority of the region is served by the Integrated WRZ which supplies 95% of the population served by UU. Although UU predicts over 630,000 new houses will be built in the WRZ between 2006 and 2035 the WRMP identifies that there is enough security in existing supplies and through existing demand management measures to enable resources to suffice until 2022/23, only after then will further actions be required. UU has identified that this deficit from 2022 onwards can mostly (64%) be provided by increasing supply sources. However prudent use of existing water supplies would reduce the uncertainty of the impacts of climate change upon new water sources. As the full impact of climate change is still unknown, any future sources may not be able to be relied upon.

The proportion of new houses to be built in the Blackpool and Central Lancashire WCS area over the timeframe of the WRMP represents a small proportion of the total number of new houses anticipated within the WRZ. This coupled with a positive supply-demand balance until 2022/23 means it is therefore not necessary to recommend stringent water efficiency measures for new houses at the present time. It is however recommended that planning policy be fully implemented to ensure that water efficiency is promoted. Policy makers should also be mindful that in the short to medium term there are many uncertainties surrounding factors which may impact upon water supply such as the Water Framework Directive and changes in Building Regulations which may require policy to be updated.

7 Wastewater Infrastructure Assessment

7.1 Introduction

This section of the report discusses the existing wastewater treatment infrastructure within Central Lancashire and Blackpool. The wastewater assessment has been undertaken in close consultation with United Utilities. The purpose of the wastewater assessment is to identify whether there is sufficient hydraulic infrastructure capacity[14] at the wastewater treatment works (WwTW) and within the drainage network to accommodate planned growth. The assessment focuses on strategic wastewater infrastructure (e.g. trunk sewers or pumping stations) and does not consider local network issues. If there is not sufficient capacity the analysis has identified whether capacity can be built in a timely manner to support growth.

7.2 Overview of methodology

The strategic assessment of WwTW and wastewater network hydraulic to accommodate the proposed level of growth was discussed at meetings with UU's wastewater catchment managers. For the WwTW, UU has commented on:

- the current available hydraulic capacity at each WwTW (including an estimate of the population equivalent [PE] and number of dwellings that could be accommodated before hydraulic capacity is reached);
- the current process capacity at each WwTW, and;
- the availability of land to expand the WwTW, where required.

7.3 WwTWs affected by growth

Table 7-1 illustrates the WwTW affected by growth and the indicative new dwellings and potential employment land to be developed draining to these WwTW for testing in the WCS. Figures 7-1 to 7-4 in Appendix A show locations of WwTWs in each Local Authrority area. Figures 7-5 to 7-8 in Appendix A show catchment areas of WwTWs in each Local Authority area.

WwTW name	Locations affected by growth which drain to the WwTW	Indicative number of dwellings to drain to WwTW	Indicative level of employment land to drain to WwTW (ha)
Barton	Land fronting the east side of Garstang Road Broughton, Whittingham Lane (Hudson and Walling)	259	-
Blackburn	BAE Systems Samlesbury		35
Chorley	All Buckshaw Village sites;	5851	101

14 Hydraulic capacity is defined as the ability of a WwTW to accept additional foul flows; this is not related to the performance of the WwTW *per se*, but is a reflection of the physical infrastructure in place to accept additional foul flows

WwTW name	Locations affected by growth which drain to the WwTW	Indicative number of dwellings to drain to WwTW	Indicative level of employment land to drain to WwTW (ha)
	All Eaves Green sites; All Euxton Lane sites; Crosse Hall Farm; Park Mills/ Oakwood Road; Talbot Mill; Former Lex Auto Logistics Site, Pilling Lane; Cowling Farm / Cowling Mill; William Lawrence Site, Townley Street; Quarry Road; West of Blackburn Road; Vertex Training and Conference Centre, Little Carr Lane; Land behind and west of Blackburn Brow; Land off Duke Street; Botany Sites; Group 1; Regional Investment Site; Southern Commerical Area; Gillibrand; Aldi Site, Matrix Park		
Croston	Sites in Chorley BC: Blainscough Lane / works; Waggon and Horses; Woodyard, Station Road; Sagar House; Land off Parr Lane, Tincklers Lane, New Street.	454	27
Fleetwood Marsh	All Blackpool BC development sites	5514	6
Horwich	Bolton West motorway services (North and South)		11
Leyland	Moss Side Test Track sites; Safeguarded sites c, d, e, i Roadferry; Farrington Park; Leyland and Birmingham Rubber Works; Former Prestolite premises, Golden Hill Lane; Fact Focus Sites (c and Brackenhouse); Slater Lane/Expac (site o); East of A49- Safeguarded Land; Regional Investment Site,	2493	177
Longton	School House Farm, Liverpool Road Plocks Farm Liverpool Road	50	27
Preston (Clifton Marsh)	All Preston development sites except Land fronting the east side of Garstang Road Broughton and Whittingham Lane (Hudson and Walling).	10153	120

WwTW name	Locations affected by growth which drain to the WwTW	Indicative number of dwellings to drain to WwTW	Indicative level of employment land to drain to WwTW (ha)
Walton-le-Dale	Radburn Works, Radburn Brow; Land off Bournes Row, Blackburn Road; Land North of Town Lane; Land to the west of Lucas Lane; Land at Croston's Farm, Lucas Lane	2978	135
Wigan (Hoscar)	Railway Road and Land off Bolton Rd Baly Place Farm (both Chorley BC)	276	

Table 7-1 WwTW affected by growth

7.4 WwTW infrastructure capacity

7.4.1 Barton WwTW

Barton WwTW lies to the north of Preston and treats flow from a small catchment to the north of the M55. The works has been upgraded from 5700 to 6500 PE and UU has indicated that there is capacity within the consent to accommodate the flow from an estimated 61 additional properties, and the WwTW is considered to be able to accept increased flows, although there are occasional "spikes" of effluent ammoniacal nitrogen. Flow measurement is currently ongoing. However there is history of some flooding in the catchment, and so the point of connection to the public sewer would need to be agreed before planning consent were granted and no surface water should be routed to the wastewater network.

7.4.2 Blackburn WwTW

Blackburn WwTW lies to the east of Preston and treats flow from Broughton and Blackburn. There is no significant projected domestic growth within the catchment, but expansion of business facilities – principally office accommodation – is planned.

UU has indicated that Blackburn WwTW presently has spare capacity, but it has been noted that there is unused capacity within the trade effluent consent of a brewery located within the WwTW catchment, and if they were to exploit this capacity, the treatment works would be fully loaded. Works improvements are in hand, funded by a quality driver to reduce consented effluent suspended solids to 40 mg/l. This is necessary to improve optical transmissivity to ensure effective ultra-violet disinfection. Additional storm water storage is also being provided.

The flow measuring device is being relocated, and therefore measured flow data is not available. Modelling is currently being undertaken.

7.4.3 Chorley WwTW

Chorley WwTW lies just to the west of Chorley and treats flow from Euxton and surrounding areas.

The Chorley WwTW has a consented flow capacity of 17,150m^3/day and is generally under capacity - the present dry weather flow based upon the lower 20 percentile is 12,800 m^3/day. However the limiting factor on development may be the inlet to the pumping station which may need to be reviewed. Flow to Chorley is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved. The Buckshaw Village development in particular is expected to be problematic in conveying the flow to the works and UU is applying for funding to upsize the sewers in this area as part of their business plan, to be able to accept flows from the Buckshaw Village development. The timescale for this work would be the end of the current AMP (2015). However, there is presently a risk of deterioration due to ongoing growth before the solution can be put into place.

Other developments would need a detailed look at the connection point. Sites in the northern part of the catchment would need to be referred to UU to discuss the timing of the developments. No surface water should be routed to the wastewater network.

The model of the Chorley WwTW and network is currently being revised by UU.

7.4.4 Croston WwTW

Croston WwTW lies near the settlement of Croston and treats flow from Croston, Eccleston, Charnock Richard, Coppull and Mawdesley. An additional 454 dwellings are planned within the catchment, but there is capacity within the consent to accommodate flow from up to 900 properties. Croston works also has a current major capital scheme addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue at the works once the scheme is complete.

Storm storage (15,000m^3) is being installed along the network and will be complete by March 2013. Croston catchment is a long catchment which has several intermediate pumping stations which transfer flows. There are many local flooding issues within the catchment so any new connection points and potentially also the intermediate pump station capacities would need careful review. Any new development would need a bespoke assessment by UU. No additional surface water should be routed to the wastewater network.

7.4.5 Fleetwood Marsh WwTW

Fleetwood Marsh WwTW lies to the north of Blackpool and treats flow from the Blackpool area.

A capital scheme to address supply demand issue has recently been completed at Fleetwood which has increased the WwTW capacity. The proposed increase in loads from development of 5500 domestic properties in the Central Lancs and Blackpool area by 2026 should therefore not be a limiting factor, although it must be noted that the Fleetwood Marsh WwTW also serves sub-catchments from neighbouring districts, and these will also be subject to future growth. The discharge consent has been modified to include increased Dry Weather Flow (DWF) to take account of the increase in development.

However there are major network capacity issues in the Blackpool and Fleetwood WwTW catchments. The main transfer tunnel south to north is overloaded and there issues with too many spills occurring during the bathing season. UU are looking at ways in which surface water can be taken out of the system to increase the capacity for foul flows. An example of options considered are SUDS type solutions or other measures to separate surface water flow, because it is considered that further storage of surface water is not a long term sustainable option for managing drainage. There are storm tanks of 170m^3 capacity within Blackpool and all flow from these goes via the Fleetwood WwTW (i.e. there is no discharge point to the Irish Sea). SUDS should not discharge to the wastewater network but to natural watercourses.

The projected growth is to the South of Blackpool, whereas the treatment works is to the North, and therefore the additional flow must pass through the existing, combined sewerage system, which is already overloaded. The town is constrained by the Irish Sea to the West and the estuary to the East, and so it would be a time consuming and costly exercise to provide a new system to convey flow from the development directly to the treatment works.

Any increase in foul flow due to development, not mitigated by a reduction in surface water flow will result in an increase in spill frequency and spill volume from existing combined sewer overflows and will consequently be unacceptable if "no deterioration" is a requirement. However, for the reasons outlined, undertaking separation schemes in this urbanised area will be a time consuming and costly exercise. For this reason, if no deterioration in terms of spill frequency is acceptable, development cannot proceed until United Utilities are able to identify and undertake separation of surface water at least equivalent to the projected increase in foul flow. There is potentially an option for some foul flows at the south end of the catchment to go to Clifton Marsh via the Lythem/Fairhaven catchment but logistics of engineering the transfer would need to be looked at and may not be any easier than going via the current main transfer tunnel.

Overflow alleviation work is currently being undertaken in the Poulton area to satisfy local Unsatisfactory Intermittent Discharges (UIDs) and overflow spills and there possibility of taking some of the network flows from Fleetwood. In April 2012 UU will table possible solutions to the Environment Agency. UU has funding to 2012 to investigate and identify solutions but as yet has no funding beyond 2012 to implement any solutions.

UU is currently undertaking flow monitoring for Fleetwood which will be verified by August 2011. Modelling of potential solutions will be undertaken after the verification process.

7.4.6 Horwich WwTW

Horwich WwTW lies near to Bolton West Services off the M61 and treats flow from Horwich. There is no projected residential development in the catchment, but flows from the proposed extension to the existing motorway service stations would be received at Horwich. The projected flow from this development, which would drain directly to the treatment works via a requisitioned sewer or rising main is not known, but there is headroom equivalent to a DWF of approximately 3000 m^3/d within the consent, which will be more than adequate. The WwTW is of reasonable capacity, but there are issues regarding effluent ammonia "spikes" and so some improvement to the process may be necessary to maintain compliance.

7.4.7 Leyland WwTW

Leyland WwTW lies to the south of the settlement of Leyland and treats flow from the south and the east of Leyland. Leyland WwTW serves a Population Equivalent (PE) of approximately 40,000.

There is a major capital maintenance scheme ongoing at Leyland WwTW at present to improve compliance issues with respect to the limit on ammoniacal nitrogen, but this will not provide any further capacity. This maintenance scheme will report in 2012. This scheme does not have a future maintenance design horizon but will assist with current problems. Precise DWF capacity is not available (the Mcerts scheme has not yet been commissioned) however, the capacity is circa 11,000m^3/day. The proposed AMP5 /6 increase of approximately 10% would be of concern as operational information would suggest that the works may not have this capacity. Peak flow to works is 28,600m^3/d.

There is projected development of approximately 2500 dwellings by the year 2026, and the treatment works will not be able to accommodate this additional load, either within its consented flow or the existing treatment units. United Utilities has a proposal to divert the flow from a significant development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available. The remaining, smaller developments can be accommodated at Leyland WwTW, although it would be necessary to agree a suitable point of connection into the network to avoid increasing the spill frequency of existing CSOs.

There are also network flooding issues in the Leyland catchment and points of connection would need careful review by UU. Surface water should not be routed into the wastewater network.

7.4.8 Longton WwTW

Longton WwTW lies to the south of the settlement of Longton and treats flow from Hutton, New Longton and Walmer Bridge. Longton WwTW serves a Population Equivalent (PE) of approximately 13,000.

The proposed development of 50 properties is small in relation to the existing load, representing an increase of approximately 1%, and the treatment works, which is currently being improved to meet a tightened consent limit with respect to biochemical oxygen demand (BOD) will be able to accommodate this increased flow. However the Pickerings Farm (Central Lancashire Urban Village) site could be accommodated at the Preston (Clifton Marsh) WwTW.

There is, however a constraint with respect to the network, as the sewer which would receive this flow has recorded incidents of external flooding, and has no capacity to receive additional growth. It may therefore be necessary to undertake reinforcement, or to provide a new rising main to convey any additional flow directly to the treatment works.

Flow monitoring has been on-going for approximately six months. A flow survey is also on-going to investigate flooding within the catchment.

7.4.9 Preston (Clifton Marsh) WwTW

Preston (Clifton Marsh) WwTW lies to the west of Preston and treats flow from the urban area of Preston and the western area of Walton-le-Dale, Penwortham, Freckleton, Lytham and St Annes and Kirkham. There is projected growth of over 10000 dwellings by the year 2026, but the treatment works is large (the growth represents approximately 6% of the present load) and can accommodate this within the present, consented dry weather flow (79,500 m^3/d).

There are, however constraints within the network which is predominantly a combined system, and it will be necessary to undertake surface water separation to mitigate any increased spill frequency or volume from existing CSOs, in order to meet no deterioration requirements. Furthermore, although the existing sewers are classed as combined, the planning consent should not permit the addition of any additional surface water into the network, and so surface water drains will be required to convey roof and road water from the development to a suitable point of discharge.

UU is currently modelling the increase in foul flows to the WwTW and network but not any increase in surface water, therefore surface water should be kept out of the wastewater network.

7.4.10 Walton-le-Dale WwTW

Walton-le-Dale WwTW lies to the east of Walton-le-Dale and treats flow from Walton-le-Dale, Bamber Bridge and areas of the west of the M61.

There is a large supply / demand project ongoing at Walton-le-Dale WwTW hence there should not be any capacity issues when this is completed. The design horizon (2031) increase in capacity was taken as 1281m^3/d Dry Weather Flow by the scheme designers, and this should be adequate to accommodate the estimated flow from the projected 2980 dwellings proposed to the year 2026.

Connections of future developments and transfer of flows would need to be considered on a project by project basis. No surface water should be routed to the wastewater network.

UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.

7.4.11 Wigan (Hoscar) WwTW

Wigan (Hoscar) WwTW lies to the west of the village of Parbold and treats flow from Appley Bridge and Standish.

Wigan is a large works, and the projected growth is relatively small (276 dwellings to the year 2026). There are local flooding issues in the catchment so consideration of the wastewater network will be needed. Wigan WwTW has known capacity issues relating to both hydraulic overloading of the inlet and biological loading of the process. UU is seeking to invest £20 million to refurbish part of the process, but this represents approximately 50% of the total capacity. Further investment is required to complete the works. This is not intended to necessarily increase capacity but to address historical issues. Small scale developments may be acceptable but large scale developments with the WwTW catchment are would be problematic.

The proposed development is in Adlington at the far end of the catchment and would be conveyed to treatment via several on line pumping stations, any of which could have capacity issues. It may be feasible to divert the flow from Adlington Village to the Horwich network, which is geographically much closer, but a detailed study would be required to determine the feasibility of this option. Due to local flooding issues, surface water should not be routed to the wastewater network.

8 Water Quality

8.1 Wastewater treatment and water quality

A review of water quality is required during the development process to ensure that development does not adversely affect water quality, and does not hinder the ability of a water body to meet the WFD. This overview outlines the process to assess water quality as part of the WCS.

Effluent from development can adversely affect water quality in two principal ways:

- increases in final effluent load from WwTW which causes a deterioration of water quality, and;
- increases in intermittent discharges from combined sewer overflows (CSOs), pumping stations, and storm tanks at WwTW – the potential for development to affect the operation of overflows has been assessed as part of the wastewater assessment.

The future expansion potential of a wastewater treatment works with respect to water quality is determined by assessing the discharge consent, set by the Environment Agency. This consent is based on the ecological sensitivity of the receiving watercourse and specifies a maximum flow and a minimum effluent quality that the WwTW has to achieve to meet water quality targets without causing environmental damage.

As the population connected to a wastewater treatment works increases, the amount of treated wastewater (or effluent) being discharged to the receiving water generally increases in proportion to the population increase. When this increased population causes the treatment works to exceed the consented maximum discharge volume allowed by the Environment Agency consent, improvements are likely to be required to the treatment works to improve the standard of treatment and to ensure river quality does not deteriorate.

The quantity of treated effluent discharged from each treatment works and its quality is specified by the legal discharge consent, issued by the Environment Agency under the Water Resources Act 1991. The consent is normally based upon the Dry Weather Flow (DWF) of the treated effluent, and stipulates limits for the concentration of biochemical oxygen demand (BOD), total suspended solids (TSS) and ammoniacal nitrogen (NH3). Compliance is determined by means of statistical analysis of effluent quality data. To this end the DWF and quality of discharge from a WwTW forms the "planned water quality"; that is the water quality the Environment Agency would expect if the WwTW was discharging at its DWF and discharge consent. The planned water quality has typically been based on the River Ecosystem Classification of a river reach.

In the foreseeable future, consent limits will be set with a view to meeting the requirements of the Water Framework Directive (WFD) whose aim is to ensure that good river quality standards are met throughout each waterbody. The intention is to set the discharge consent limits based upon the quality and volume of the receiving watercourse and the volume of wastewater effluent at the point of discharge. However, the means of applying these principles to an individual discharge when upstream quality is already unsatisfactory, or when upstream flow provides inadequate dilution to maintain "good" quality status using conventionally applied wastewater treatment techniques, is presently unclear.

8.1.1 Water Framework Directive

The Water Framework Directive (WFD) came into force in December 2000, and was transposed into UK law in December 2003. It is the most substantial piece of European Commission water legislation to date and is designed to improve and integrate the way water bodies are managed throughout Europe. Under the WFD all Member States must:

- prevent deterioration in the classification status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- aim to achieve at least good status for all waters by 2015. Where this is not possible, good status should be achieved by 2021 or 2027;
- promote sustainable use of water as a natural resource;
- conserve habitats and species that depend directly on water;
- progressively reduce or phase out releases individual pollutants or groups of pollutants that present a significant threat to the aquatic environment;
- progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants, and;
- contribute to mitigating the effects of floods and droughts.

No deterioration

The first principle of the WFD is to prevent deterioration in aquatic ecosystems. No deterioration must be met in all but very exceptional circumstances. Exceptional circumstances apply when the deterioration is caused by physical modifications to the water body, for example for flood risk management reasons, or the result of sustainable new human development activities. Even in such cases it is necessary to demonstrate that there was no better way to achieve the desired development, that there are no possible mitigation measures, and that it is technically infeasible or disproportionately expensive to do so. In addition, no deterioration requires that a water body does not deteriorate from its current ecological or chemical classification, and applies to individual pollutants within a water body. The Directive allows for deterioration within the limits of a status or classification. For example, if dissolved oxygen is currently classified at moderate status then the first principle of the WFD would be to ensure no deterioration from moderate class, the limited numerical deterioration acceptable within each classification or status would not constitute a breach of the Directive or be reported as deterioration. In exceptional circumstances only, it is acceptable to allow a deterioration of chemical status from high to good status only.

Box 7.1 shows article 4.7 of the Directive which covers the exemptions from no deterioration

Box 7.1: Text of Water Framework Directive Article 4.7

Member States will not be in breach of this Directive when:

- *failure to achieve good groundwater status, good ecological status or, where relevant, good ecological potential or to prevent deterioration in the status of a body of surface water or groundwater is the result of new modifications to the physical characteristics of a surface water body or alterations to the level of bodies of groundwater, or*
- *failure to prevent deterioration from high status to good status of a body of surface water is the result of new sustainable human development activities*

and all the following conditions are met:

(a) all practicable steps are taken to mitigate the adverse impact on the status of the body of water;

(b) the reasons for those modifications or alterations are specifically set out and explained in the river basin management plan required under Article 13 and the objectives are reviewed every six years;

(c) the reasons for those modifications or alterations are of overriding public interest and/or the benefits to the environment and to society of achieving the objectives set out in paragraph 1 are outweighed by the benefits of the new modifications or alterations to human health, to the maintenance of human safety or to sustainable development, and

(d) the beneficial objectives served by those modifications or alterations of the water body cannot for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option.

Good status

Under the WFD the objective is for all water bodies to meet good ecological status by 2015. For surface waters (rivers, lakes, transitional waters), good ecological status can be defined as:

- good chemical status for the relevant substances (there are also a series of daughter directives);
- good physico-chemical status on the scale high, good, moderate, poor and bad;
- good biological class, and;
- good hydro-morphological class.

The status of a water body is measured through a series of specific standards and targets that have been developed by the UK administrations, supported by the 15WFD UK Technical Advisory Group (www.wfduk.org).

The manner in which overall status is assessed is by using a 'one out, all out' approach. That is, the status is determined by the lowest common denominator. Figure 8-1 shows how this works in practice.

[15] (United Kingdom Technical Advisory Group (UKTAG) 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. www.wfduk.org.

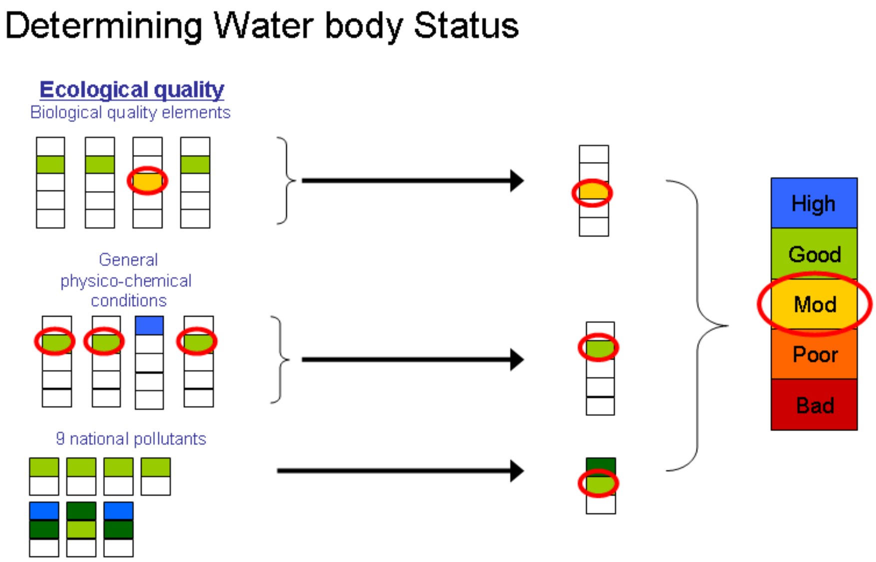

Figure 8-1 Determining water body status

Alternative objectives

Although the WFD specifies that good status should be met by 2015 there are circumstances where it is possible to delay meeting good status until 2021 or 2027, or where a lesser objective will be required. These circumstances include technical feasibility, disproportional costs, or natural conditions (recovery times). In most instances it is likely that these circumstances will lead to an extended deadline (i.e. 2021 or 2027) to meet good status, rather than setting a less stringent objective. A less stringent objective can be set for specific bodies of water when they are so affected by human activity, or their natural condition is such that the achievement of these objectives would be infeasible or disproportionately expensive, subject to certain conditions being met. These conditions include that the environmental and socioeconomic needs served by such human activity cannot be achieved by other means, which are a significantly better environmental option not entailing disproportionate costs, that the highest ecological and chemical status possible is achieved, given impacts that could not reasonably have been avoided due to the nature of the human activity or pollution, and that no further deterioration occurs.

Under Article 4 (3) of the WFD it is possible to designate water bodies as artificial or heavily modified water bodies. The WFD recognises that some water bodies have been modified to provide valuable social or economic benefits, and it is recognised these water bodies are not able to achieve natural conditions, and hence should not be required to achieve good ecological status. Artificial or heavily modified water bodies therefore have an alternative objective of meeting "good ecological potential" and these are identified in the draft River Basin Management Plans. Good ecological potential does not downgrade the targets - all the relevant environment standards still need to be achieved and the physical features that affect ecology improved.

8.1.2 Environmental capacity assessment

Based on the data and information available for the outline WCS we have identified the level of growth predicted to drain to each WwTW and identified the current WFD classification of the water bodies which WwTW discharge into (from the Environment Agency's 'What's in my backyard' website[16]). The results from this

[16] http://www.environment-agency.gov.uk/homeandleisure/37793.aspx

assessment are presented in Table 8-1. Where a receiving waterbody has been assessed as not currently meeting good status (all but two of the water bodies assessed, see Table 8-1) it is likely that more stringent discharge consents will be needed to ensure good status is met. Any changes to the consent to meet the requirements of the WFD will be promoted through the National Environment Programme (NEP) and agreed and incorporated into United Utilities' five year business plans.

In addition a WwTW which discharges to a watercourse with greater dilution is likely to require a less stringent consent to ensure no deterioration or to meet good WFD status.

Further work will be needed to ensure that growth does not cause deterioration of current water body status and that growth does not make it more difficult to achieve good WFD status. Simplified Monte Carlo simulations can be undertaken, using the Environment Agency River Quality Planning (RQP) toolkit to identify indicative future discharge consents in light of growth.

River Quality Objectives (RQOs) were agreed by Government as targets for all rivers in England and Wales when the water industry was privatised in 1989. These targets how now been replaced by the WFD objectives but have been included in the Tables below to act as a reference point for those who are familiar with the RQO system. A river quality objective, or RQO, is a target used to ensure the water quality is suitable to support certain Uses (such as Public water supply). Each river stretch has a group of Uses and the amalgamation of the standards of these Uses gives a set of water quality standards. The Environment Agency system for setting the Objectives is also referred to as the River Ecosystem (RE) classification and the categories are as follows:

- RE1: Water of very good quality and suitable for all fish species.
- RE2: Water of good quality and suitable for all fish species.
- RE3: Water of fair quality and suitable for high class coarse fish species.
- RE4: Water of fair quality and suitable for coarse fish species.
- RE5: Water of poor quality which is likely to limit coarse fish populations.

WwTW	Additional DWF due to growth up to and beyond 2026 (m3/d)	WwTW comments	Waterbody Name	Water Body ID	Overall Physico chemical Status (EcoGen)	Overall Biological Status (EcoBio)	Overall HM Status (EcoHM)	Overall Ecological Status (EcoClass)	Ecological Status Objective (EcoObj)	RQO
Barton	23	Barton considered OK for increased flows	Barton (Westfield) Brook	GB112072065800					Good ecological status by 2027	3
Blackburn	0	No flow details of development but Blackburn has spare capacity.	River Darwen	GB112071065300					Good ecological status by 2027, good chemical status by 2027	4
Chorley	2325	Works has a consented flow capacity of 17,150m^3/day but the limiting factor may be the inlet pump station which would need reviewing.	River Yarrow DS Big Lodge Water	GB112070064952					Good ecological potential by 2027, good chemical status by 2015	3
Croston	170	Croston works has major capital scheme addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	River Yarrow	GB112070064870					Good ecological potential by 2027	4
Fleetwood Marsh	2199	A capital scheme to address supply demand issue has recently been complted at Fleetwood which hs	Wyre transitional water body	GB531207212200					Good ecological potential by	N/A

WwTW	Additional DWF due to growth up to and beyond 2026 (m3/d)	WwTW comments	Waterbody Name	Water Body ID	Overall Physico chemical Status (EcoGen)	Overall Biological Status (EcoBio)	Overall HM Status (EcoHM)	Overall Ecological Status (EcoClass)	Ecological Status Objective (EcoObj)	RQO
		increased the capacity. The proposed increase in loads should not cause a problem.							2027, good chemical status by 2015	
Horwich	0	No details of the volume of increased flow but would expect that the works which is of reasonable capacity would cope.	River Douglas	GB112070064850			N/A		Good ecological potential by 2027, good chemical status by 2015	4
Leyland	935	There is a capital maintence sheme ongoing at present to improve compliance issues (NH3) but this will no provide any further capacity. Precise DWF capacity is not available (the Mcerts scheme has not yet been commissioned) however, the capacity is cira 11,000m^3/day. The proposed AMP5 /6 increase of approx 10% would be of concern as the works may not have this capacity. Peak flow to works is 28,600m^3/d.	River Lostock DS Farington Weir	GB112070064912					Good ecological potential by 2027, good chemical status by 2015	3
Longton	19	Longton WwTW has a current Q scheme, small increase in flow from development should not be a problem.	Tarra Carr Gutter	GB112070064900					Good ecological potential by 2027, good	4

WwTW	Additional DWF due to growth up to and beyond 2026 (m3/d)	WwTW comments	Waterbody Name	Water Body ID	Overall Physico chemical Status (EcoGen)	Overall Biological Status (EcoBio)	Overall HM Status (EcoHM)	Overall Ecological Status (EcoClass)	Ecological Status Objective (EcoObj)	RQO
									chemical status by 2015	
Preston (Clifton Marsh)	3915	Preston is a large works and the increase in flow is not considered an issue	Ribble transitional water body	GB531207112400					Good ecological potential by 2027, good chemical status by 2015	N/A
Walton-Le-Dale	1117	Walton-Le-Dale has a large supply / demand project ongoing hence there should not be any capacity issues. The design horizon increase in capacity was taken as 1281m³/d by the scheme designers.	Ribble transitional water body	GB531207112400					Good ecological potential by 2027, good chemical status by 2015	N/A
Wigan (Hoscar)	104	Wigan is a large works so relatively small proposed increase in flows is not considered a problem	River Tawd	GB112070064790					Good ecological potential by 2027	Unknown

Table 8-1: Current water body status

Symbol	Status
	High
	Not High

	Good
	Moderate
	Poor
	Bad

9 Preston City

9.1 Introduction

This chapter provides a summary of the key findings from the outline WCS, the Red-Amber-Green assessment for specific development areas within the Preston City area and a list of recommendations for Preston City.

9.2 Overview of key issues

The key issues and constraints from the outline WCS are identified below.

- There is hydraulic capacity at Preston (Clifton Marsh) WwTW to accommodate growth. For some developments the connection point to the wastewater network will need to be agreed between UU and the developers. No surface water runoff should enter the wastewater network in the Savick Brook / Leargate areas (see Table 9.2 for specific development areas).

- There is likely to be sufficient capacity at Barton WwTW to accommodate the proposed level of growth. However local connection issues have been identified and there is a history of flooding in the catchment.

- The geology underlying much of Preston City area is highly permeable, and it is therefore deemed to have a higher potential for infiltration SUDS. However, the high permeability of the rock means that it is in use as a water resource. The SPZ indicate boreholes need to be protected. Therefore, whilst infiltration SUDS should be largely applicable, due consideration should be given to the presence of SPZs when determining whether infiltration SUDS are likely to be applicable.

- Preston lies within the Integrated Water Resource Zone (WRZ). There is a positive supply-demand balance in water supply until 2022/23. UU has identified that there will be a deficit in water supply from 2022/23 and this can be addressed by leakage reduction and water efficiency measures until 2025. UU has identified that this deficit from 2022 onwards can mostly be provided by increasing supply sources. However planning requirements to use water more efficiently now would reduce the reliance on new water sources, especially as climate change impacts on these sources are unknown. The population of the study areas of the WCS represents a small proportion of the total population for the Integrated WRZ. The number of new households estimated between 2006 and 2035 represents a small proportion of the total number of new households in the Integrated WRZ as a whole. Thus any additional demand for water from new properties in the Blackpool and Central Lancashire areas in future will represent only a very small proportion of the total demand for the WRZ.

- The policy for the Central Lancashire Published Core Strategy has been provided, this Policy 29 "Water Management" states: "Improve water quality, water management and reduce the risk of flooding by:

  a) Minimising the use of potable mains water in new developments;

b) Working with the regional water company and other partners to promote investment in sewage water treatment works to reduce the risk of river pollution from sewage discharges;

c) Working with farmers to reduce run-off polluted with agricultural residues into watercourses;

d) Appraising, managing and reducing flood risk in all new developments, avoiding development in high flood risk areas wherever possible and appropriate, particularly in vulnerable parts of Croston, Penwortham, Walton-le-Dale and southwest Preston;

e) Pursuing opportunities to improve the sewer infrastructure, particularly in Grimsargh, Walton-le-Dale and Euxton, due to the risk of sewer flooding;

f) Managing the capacity and timing of development to avoid exceeding sewer infrastructure capacity;

g) Encouraging the adoption of Sustainable Drainage Systems;

h) Seeking to maximise the potential of Green Infrastructure to contribute to flood relief.

- Barton WwTW discharges into Barton (Westfield) Brook. The water body is currently rated "moderate" for overall physico-chemical status and "good" for overall biological status, with an overall ecological rating of "moderate." Preston WwTW discharges into the Ribble, a transitional water body. The water body is currently rated "moderate" for overall physico-chemical status and "good" for overall biological status, with an overall ecological rating of "moderate."

- Where a receiving waterbody does not currently meet good status it is likely that more stringent discharge consents will be needed to ensure good status is met. Any changes to the consent to meet the requirements of the WFD will be promoted through the National Environment Programme (NEP) and agreed and incorporated into United Utilities' five year business plans. Further work will be needed to ensure that growth does not cause deterioration of current water body status and that growth does not make it more difficult to achieve good WFD status.

- It is considered that flood risk will not be a barrier to development, because there is sufficient land at low flood risk to allow development to occur outside of flood risk areas. Within Preston there are some minor flood risk constraints along the River Ribble and minor watercourses in the north of the city. Lancaster Canal will need to be considered should development occur adjacent to the canal. No flood risk issues were identified in the rural settlements of Grimsargh and Goosnargh.

9.3 Summary of WCS findings

The outline WCS has not identified any absolute barriers to development in Preston, although it is recognised that there are some constraints to development which need to be addressed. The findings from the outline WCS are summarised through in Table 9-2 which outlines the key findings and overall assessment for each development site, and provides an overall summary of the red, amber, green assessment.

Red, amber green	WwTW capacity description	Wastewater network capacity description	Flood Risk	Surface Water Management
RED	No existing capacity at the WwTW and/or there are known planning constraints to additional capacity	Significant existing capacity constraints exist, and require upgrading to accommodate growth	Concerns that there is not sufficient land at low flood risk to accommodate development	Neither inflitration nor attenuation SUDS viable
AMBER	WwTW requires upgrade and there are no known planning issues	Minor upgrades to the sewer system likely to be required to accommodate growth	Flood risk may be a constraint in some parts of the settlements (either within the existing settlement, or on potentially developable land)	Either infiltration or attenuation SUDS viable
GREEN	WwTW has capacity to cater for proposed growth	Sewerage system has capacity to cater for proposed growth. CSO - upstream PE increasing by less than 10% of design PE	Flood risk not considered to be a constraint	Both infiltration and attenuation SUDS viable.

Table 9-1 Criteria for RAG assessment

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Residential sites						
Lightfoot1	Lightfoot1	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Plus part of site is in SPZ 2 where extra precautions re treatment may be necessary. Good prospects for attenuation due to nearby watercourse. SPZ 2 may mean that extra treatment to improve water quality is required.	Agreement with UU required on connection point to wastewater network. Agreement with EA required on attenuating runoff to nearby watercourses and any treatment required.
Lightfoot2	Lightfoot2	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Plus extra precautions re treatment may be necessary within SPZ 2 and, especially, SPZ 1. Good prospects for attenuation due to nearby watercourse. SPZ 2 may mean that extra treatment to improve water quality is required.	Agreement with UU required on connection point to wastewater network. Agreement with EA required on attenuating runoff to nearby watercourses.
Brockholes/ Birley Bank	LP1	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a	There are constraints within the network therefore no surface water should be routed to the network.	Located in flood zone 1. Flat, low level land. Falls steeply down to Ribble. Flood risk	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby	Favourable location for development with no major constraints known.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		constraint to growth.	An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	should not constrain growth.	watercourse.	
Crummock Road	OTHER1	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Falls steeply to north and east of site to Brockholes. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable.	Favourable location for development with no major constraints known if agreement reached with UU on connection to wastewater network.
Alliance Works, Goodier Street and part of Manchester Mill	PEN01	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through	Located in flood zone 1. Flood risk should not constrain growth.	Good prospects for infiltration in the west of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the east. Good prospects for attenuation due to nearby watercourse.	Favourable location for development with no major constraints known.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			requisition process.			
Alstoms, Channel Way	PEN02	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Site located almost entirely within flood zone 2 and 3 from the River Ribble. Major constraints due to flooding.	Good prospects for infiltration in the south of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the north. Good prospects for attenuation due to nearby watercourses.	Significant flood risk. Only recommended land uses should be developed. Site specific FRA required. Sequential approach to site design required. Agreement with UU required on connection point to wastewater network. Agreement with EA required on attenuating runoff to nearby watercourses.
GOSS Graphics	PEN03	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located within flood zone 1. Flood risk should not constrain growth, however confirm level of risk from Lancaster Canal.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse	Favourable location for development with no major constraints known.
Cottam Hall Brickworks	PEN05	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW	There are constraints within the network therefore no surface water should be	Located in flood zone 1. Flat, high level land. Flood risk should not	Superficial Till may prevent infiltration being viable. Good prospects for	Favourable location for development is agreement is reached on connection point

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		capacity should not be a constraint to growth.	routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	constrain growth, however confirm level of risk from Lancaster Canal.	attenuation due to nearby watercourse.	to wastewater network.
Cottam Hall, off Tom Benson Way, Preston	PO01	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth, however confirm level of risk from Lancaster Canal.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Agreement with UU required on connection point to wastewater network. Agreement with EA required on attenuating runoff to nearby watercourses. Confirm level of risk from Lancaster Canal.
Land at Eastway	PO03	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which	Located in flood zone 1 apart from extreme south east corner. Flood risk should not constrain growth,	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Favourable location for development with no major constraints known.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			could be agreed through requisition process.			
Land fronting the east side of Garstang Road, Broughton	PO14	No issues identified with capacity at Barton WwTW. WwTW capacity should not be a constraint to growth.	There is history of some flooding in the catchment, and so the point of connection to the public sewer would need to be agreed before planning consent were granted and no surface water should be routed to the wastewater network.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses. SPZ 2 may mean that extra treatment to improve water quality is required	Favourable location for development with no major constraints known.
Parker Street, Preston	PO19	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth, however confirm level of risk from Lancaster Canal.	Superficial Till may prevent infiltration SUDS being viable. Good prospects for attenuation due to nearby watercourse.	Favourable location for development with no major constraints known. Level of risk from Lancaster canal should be confirmed.
Land off Blackpool Road/Dodney	PO44	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW	There are constraints within the network therefore no surface water should be	Northern section of proposed development site situated within flood	Good prospects for infiltration in the south of the site due to permeable	Favourable location for development with no major constraints known.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Drive, Lea		capacity should not be a constraint to growth.	routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	zone 2 and 3 from Millennium Ribble Link. Sequential approach to site design should be adopted.	geology. Superficial Till may prevent infiltration being viable in the north. Good prospects for attenuation due to nearby watercourses.	
Land off Whittingham Lane, Longridge	PO47	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Undulating, high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Favourable location for development with no major constraints known.
Ingol Golf Club	PO71	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which	Flood zones 2 and 3 present through the middle of the site with risk from Sharoe Brook. Sequential approach to site design should be adopted.	Infiltration SUDS may also be unfeasible due to geology and presence of SPZ 1. Good prospects for attenuation due to nearby watercourse.	Surface water should not be routed to wastewater network. Attenuation SUDS most likely to be viable. Need agreement from EA on attenuating to watercourses. Site specific FRA required. Sequential approach to site

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			could be agreed through requisition process.			design required.
Spar Depot, Blackpool Road (47)	SE09	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	Surface water should not be routed to wastewater network. Attenuation SUDS most likely to be viable. Need agreement from EA on attenuating to watercourses.
Perry's Car Showroom, Blackpool Road (47)	SE10	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flood risk should not constrain growth.	Superficial Till may prevent infiltration SUDS being viable. Reasonable prospects for attenuation due to nearby watercourse.	Favourable location for development with no major constraints known.
Sharoe Green Hospital, Sharoe Green	UC01	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a	There are constraints within the network therefore no surface water should be	North west corner of site located within flood zone 2 and 3. Sequential approach to	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby	Surface water should not be routed to wastewater network. Attenuation SUDS most likely to be viable. Need agreement

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Lane		constraint to growth.	routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	site design required.	watercourse.	from EA on attenuating to watercourses. Site specific FRA required. Sequential approach to site design required.
Queen Street - Countryside Properties	UP01	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flood risk should not constrain growth.	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.	Favourable location for development if agreement is reached on connection point to wastewater network.
Whittingham Hospital Grounds	UP02	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1, with flood zone 2 and 3 from Blundel Brook along southern boundary. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Attenuation SUDS most likely to be viable. Need agreement from EA on attenuating to watercourses. Site specific FRA required. Sequential approach to site design required.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Avenham Car Park, Avenham Street	UP03	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth.	Good prospects for infiltration SUDS due to permeable geology. Also good prospects for attenuation due to nearby watercourse. No constraints identified at this stage.	Favourable location for development with no major constraints known.
Land to rear of Ryelands Crescent and Thurnham Road	UP04	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth, however confirm flood zone originating from River Ribble very close to southern boundary.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	Favourable location for development with no major constraints known.
Whittingham Lane (Hudson and Walling)	UP05	No issues identified with capacity at Barton WwTW. WwTW capacity should not be a constraint to growth.	There is history of some flooding in the catchment, and so the point of connection to the public sewer would need to be agreed before planning	Located in flood zone 1. Undulating land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Favourable location for development with no major constraints known.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			consent were granted and no surface water should be routed to the wastewater network.			
Former St. Joseph's Orphanage, Theatre Street	UP12	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth.	Likely to be suitable for infiltration SUDS due to permeable geology. Reasonable prospects for attenuation due to nearby watercourse. No constraints identified at this stage.	Favourable location for development with no major constraints known.
Employment and Mixed Use Land						
CBD	PE02	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth.	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.	Favourable location for development with no major constraints known.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			requisition process.			
Broughton Business Park	PE03	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Agreement with UU required on connection point to wastewater network. Agreement with EA required on attenuating runoff to nearby watercourses.
Riversway (SS31)	PE04	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Site located entirely within flood zone 2 and 3 from the River Ribble. Major constraints due to flooding.	Good prospects for infiltration in the south of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the north. Good prospects for attenuation due to nearby watercourse.	Significant flood risk. Only recommended land uses should be developed. Site specific FRA required. Sequential approach to site design required. Agreement with UU required on connection point to wastewater network. Agreement with EA required on attenuating runoff to nearby watercourses.
Redscar 1	PE05	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW	There are constraints within the network therefore no surface water should be	Located in flood zone 1. Flat, high level land. Flood risk should not	Superficial Till may prevent infiltration being viable. Good prospects for	Surface water should not be routed to wastewater network. Attenuation SUDS most likely

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		capacity should not be a constraint to growth.	routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	constrain growth, however confirm flood risk from minor watercourse along southern boundary	attenuation due to nearby watercourses.	to be viable. Need agreement from EA on attenuating to watercourses.
Redscar 3	PE07	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flat, high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Surface water should not be routed to wastewater network. Attenuation SUDS most likely to be viable. Need agreement from EA on attenuating to watercourses.
Red Scar - Site F	PE08	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which	Located in flood zone 1. High level land which slopes down towards the motorway at the western boundary. Flood risk should not constrain growth, however minor watercourse in north	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	Surface water should not be routed to wastewater network. Attenuation SUDS most likely to be viable. Need agreement from EA on attenuating to watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			could be agreed through requisition process.	west corner.		
Tithebarn Regeneration Area	MRS1	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU. Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1. Flood risk should not constrain growth.	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.	Surface water should not be routed to wastewater network. Otherwise favourable location for development.

Table 9-2 Summary of WCS findings Preston City

9.4 Conclusions and Recommendations for Preston City

In Preston, the RSS requirement is to build an additional 9102 new homes. The WCS has identified potential environmental and infrastructure capacity constraints to development in Preston City and has sought to identify the preferred locations for development from a water cycle perspective.

In this section we have provided recommendations based on the findings of the WCS, and recommendations for further work. Further work can be addressed through a detailed WCS, or alternatively can be carried out as discrete packages of work, as required.

9.4.1 Water resources

There is a predicted supply-demand surplus within the study area until 2022/23, however the local planning authorities should implement planning policies to ensure the efficient use of water in both the new and existing housing and commercial stock (e.g. CSH level 3 and BREEAM excellent standards). The policy for the Central Lancashire Published Core Strategy has been provided, this Policy 29 "Water Management" states: "Improve water quality, water management and reduce the risk of flooding by (a) Minimising the use of potable mains water in new developments." This bullet point in the policy fulfils the duty to promote water efficiency however this is not translated into the actual policy itself which does not specifically mention water efficiency or use of water resources. It is therefore recommended that policies include promotion of water efficiency but are not necessarily restricted to achieving certain levels of CSH at the present time.

UU's current policy on metering includes metering of all new households and non-household properties. In addition to new development, demand must be reduced in the existing housing stock. The local planning authorities, in partnership with the Environment Agency and UU, should continue to encourage the uptake of metering in the existing housing stock, and should encourage more sustainable use of water resources through education programmes, for example.

9.4.2 Flood risk management

Developers need to follow the principles and requirements of national policy, most notably PPS25: Development and Flood Risk. Any new development should be located in the areas of lowest flood risk and must not increase risk to existing development and areas identified as functional floodplain should be protected from development. Where parts of development sites are proposed within Flood Zones 2 and 3, developers should undertake a site-specific Flood Risk Assessment (FRA) to establish the extent of Flood Zones 2, 3a and 3b, and the future risk of climate change. Further modelling may be required to establish these risk areas. Land use within these sectors should be allocated according to the appropriate use as outlined in PPS25.

The Central Lancashire Published Core Strategy Policy 29 "Water Management" should be adhered to in respect of the following points of the policy:

(d) Appraising, managing and reducing flood risk in all new developments, avoiding development in high flood risk areas wherever possible and appropriate, particularly in vulnerable parts of Croston, Penwortham, Walton-le-Dale and southwest Preston.

Surface water and sewer flooding does not appear to be a significant issue within Preston, however appropriate surface water management policies should be developed to ensure that flood risk is not increased within the site or to locations downstream. No surface water should be routed to the sewer network.

It must be ensured that all new development is 'safe,' meaning that dry pedestrian access to and from the development is possible without passing through the 1 in 100 year plus climate change floodplain, and emergency vehicular access is possible.

In Preston City there are flood risk issues which need to be considered when development proposals come forward. The recommendations include:

- The Alstoms, Channel Way and Riversway sites are at high risk from fluvial flooding from the River Ribble. Development should not be at risk from fluvial flooding and should be prioritised away from areas at higher flood risk. A site specific Flood Risk Assessment is recommended for each location to further assess flood risk and land use should be restricted to "water compatible" or "less vulnerable" uses.

- Where sites contain areas of Flood Zones 1, 2 and 3 development should be steered towards low flood risk areas.

- Residual flood risk from canal breach or overtopping should be assessed by developers as part of a FRA, where development is proposed adjacent to canals (e.g. the Lancaster canal).

- There are a number of smaller watercourses in the City which have been identified through the WCS, but have not been mapped. Where development is proposed in close proximity to these watercourses, developers should assess the flood risk as part of their FRAs.

9.4.3 Surface water management

The following recommendations are made in light of the findings of the outline WCS:

- As a minimum runoff rates and volumes from the development site should not be greater than runoff rates and volumes prior to development up to the 100 year 6 hour rainfall event (plus an allowance for climate change). In brownfield development sites a reduction of runoff rates and volumes should be achieved compared to the existing rates and volumes. The runoff requirements for a development site should be agreed with the Environment Agency at an early stage in the planning process.

- In accordance with PPS25, and the Floods and Water Management Act SUDS are required to be implemented at all scales of development. At the household level there should be a presumption away from connecting property extensions or additional hard-standing area to the sewerage network. The additional runoff should be managed at source, where possible, or connected to a watercourse (in agreement with the Environment Agency).

- Infiltration SUDS should be promoted where it is practical. Where infiltration SUDS are not applicable surface water should be discharged to a watercourse (in agreement with the Environment Agency) at a rate no greater than greenfield.

- Where infiltration SUDS are proposed, this must be supported by a groundwater risk assessment, carried out by the developer, to ensure groundwater is not polluted. Groundwater flooding should also be considered where infiltration SUDS are proposed. The presence of Source Protection Zones (SPZs) must also be considered as part of the development proposal.

- Surface water should not be connected to the sewerage network.

- In greenfield developments there should be no flooding (from all sources) on properties up to the 100 year flood event. This can be achieved through effective master planning of the development site, and may need to include an allowance for managing exceedance flows[17] if surface water drainage infrastructure is exceeded. In brownfield development it may not be possible to achieve this level of protection depending on the nature of the existing risk, but there should be a presumption against building in areas of high risk.

In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management" the adoption of Sustainable Drainage Systems should be encouraged and Local Authorieis should seek to maximise the potential of Green Infrastructure to contribute to flood relief.

In addition to the recommendations above, the assessment indicates that a combination of infiltration and attenuation based SUDS approaches are likely to be suitable across the City. In Preston, the nature of the underlying geology indicates that infiltration SUDS are likely to be most suitable.

In accordance with the Floods and Water Management Act, there should be a preference towards infiltration based SUDS approaches where they are deemed feasible. It is developers' responsibility to assess the suitability of SUDS approaches as part of their drainage planning for development.

9.4.4 Wastewater infrastructure

The following wastewater recommendations based on the findings of the outline WCS:

- Surface water should be kept out of the sewerage network. The removal of the automatic right to connect in the Floods and Water Management Act, will help sewerage undertakers reduce surface water connections to the sewerage network. It is recognised that in some locations there will be no practicable alternative other than connecting surface water to the sewerage network, but it is the responsibility of the developer to demonstrate that all other possible drainage alternatives have been explored in the first instance.

- Foul flows from new developments can be reduced through implementation of water efficiency measures and metering of all new development. This will reduce the new net burden on the wastewater network and at the WwTW.

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[17] Guidance of managing exceedance flows is provided in "Designing for Exceedance in urban drainage – good practice C635, CIRIA, 2006)

- All development proposals should be discussed with UU at the earliest possible opportunity, to understand the constraints for development and potential connection locations to the network and any upgrades required.

- Preston (Clifton Marsh) and Barton WwTWs do have hydraulic capacity to accommodate growth. There are several overflow works and UID works currently on-going within the Preston (Clifton Marsh) wastewater catchment and these need to be taken into account if development sites proceed.

- Within both the Barton and Preston (Clifton Marsh) wastewater catchments any connections to the sewerage system need to be discussed with UU.

- Development within upstream areas of pumping stations, entries on the flooding register and combined sewer overflows will need to be further assessed by UU to confirm there is adequate capacity in the wastewater network to accommodate growth, and whether any upgrades are necessary.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management" opportunities to improve the sewer infrastructure should be pursued and the capacity and timing of development should be managed to avoid exceeding sewer infrastructure capacity.

9.4.5 Water quality

The following water quality recommendations based on the findings of the outline WCS:

- In general WwTW which discharge to watercourses with a higher dilutive capacity should be considered preferable for growth, because the WwTW will have a lower impact on the watercourse.

- Growth must not cause deterioration of water quality and should not hinder the ability of a water body to meet the WFD.

- Early discussions should take place between the Environment Agency, the local planning authority and UU to confirm any new consents needed to serve growth.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management Local Authorities should work with the regional water company and other partners to promote investment in sewage water treatment works to reduce the risk of river pollution from sewage discharges.

- The study has identified WwTW catchments where there are concerns that development may cause capacity issues either at the WwTW or throughout the network. Further assessments of sustainable drainage strategies will be required in these locations. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure and to avoid any deterioration of water quality.

- If actual development differs from the proposed development used for this WCS, Preston City should consult with the Environment Agency to identify whether a WwTW will require a new consent to support growth, and if so the nature of the consent.

10 Chorley Borough

10.1 Introduction

This chapter provides a summary of the key findings from the outline WCS and a list of recommendations for Chorley Borough.

10.2 Overview of key issues

The key issues and constraints from the outline WCS are identified below.

- There is hydraulic capacity at Chorley WwTW to accommodate growth. However the limiting factor on development may be the inlet to the pumping station which may need to be reviewed. Flow to Chorley is constrained by the network capacity; plans are being looked at for a sewer upsizing project which is not yet approved. Therefore no surface water should be routed to the wastewater network. The Buckshaw Village development in particular is expected to be problematic in conveying the flow to the works. For other developments UU would need to carefully consider the connection point to the network.

- There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete. No surface water should be routed to the wastewater network. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge.

- It is expected that there would be sufficient capacity at Horwich WwTW to be able to cope with increased flows from the proposed motorway services development. However a new transfer pipe would be needed as part of the development. No surface water should be routed to the wastewater network.

- There is a large supply / demand project ongoing at Walton-le-Dale WwTW hence there should not be any capacity issues. However there are several UID projects ongoing in the catchment. Therefore no surface water should be routed to the wastewater network. Connections of future developments and transfer of flows would need to be considered on a project by project basis.

- There is hydraulic capacity at Wigan (Hoscar) WwTW to accommodate growth. However there are local flooding issues in the catchment so consideration of the wastewater network will be needed. No surface water should be routed to the wastewater network. Two developments in Chorley Borough (Railway Road and Land off Bolton Road, Baly Place Farm) are located in Adlington and transferred to Wigan via intermediate pumping stations. The capacity of these pumping stations is not known and would need checking.

- The geology underlying much of Chorley Borough is of low permeability which may prevent infiltration SUDS being feasible, even where the bedrock is more permeable. In these areas therefore, attenuation based SUDS will generally be more applicable. There are no SPZ within the Borough.

- Chorley lies within the Integrated Water Resource Zone (WRZ). There is a positive supply-demand balance in water supply until 2022/23. UU has identified that there will be a deficit in water supply from 2022/23 and this can be addressed by leakage reduction and water efficiency measures until 2025. UU has identified that this deficit from 2022 onwards can mostly be provided by increasing supply sources. However planning requirements to use water more efficiently now would reduce the reliance on new water sources, especially as climate change impacts on these sources are unknown. The population of the study areas of the WCS represents a small proportion of the total population for the Integrated WRZ. The number of new households estimated between 2006 and 2035 represents a small proportion of the total number of new households in the Integrated WRZ as a whole. Thus any additional demand for water from new properties in the Blackpool and Central Lancashire areas in future will represent only a very small proportion of the total demand for the WRZ.

- The policy for the Central Lancashire Published Core Strategy has been provided, this Policy 29 "Water Management" states: "Improve water quality, water management and reduce the risk of flooding by:

  i) Minimising the use of potable mains water in new developments;

  j) Working with the regional water company and other partners to promote investment in sewage water treatment works to reduce the risk of river pollution from sewage discharges;

  k) Working with farmers to reduce run-off polluted with agricultural residues into watercourses;

  l) Appraising, managing and reducing flood risk in all new developments, avoiding development in high flood risk areas wherever possible and appropriate, particularly in vulnerable parts of Croston, Penwortham, Walton-le-Dale and southwest Preston;

  m) Pursuing opportunities to improve the sewer infrastructure, particularly in Grimsargh, Walton-le-Dale and Euxton, due to the risk of sewer flooding;

  n) Managing the capacity and timing of development to avoid exceeding sewer infrastructure capacity;

  o) Encouraging the adoption of Sustainable Drainage Systems;

  p) Seeking to maximise the potential of Green Infrastructure to contribute to flood relief.

- Chorley WwTW discharges into the River Yarrow, downstream of Big Lodge Water. The water body is currently rated "good" for overall physico-chemical status and "poor" for overall biological status, with an overall ecological rating of "moderate." Croston WwTW discharges into the River Yarrow. The water body is currently rated "moderate" for overall physico-chemical status and "moderate" for overall biological status, with an overall ecological rating of "moderate." Horwich WwTW discharges into the River Douglas. The water body is currently rated "moderate" for overall physico-chemical status and "poor" for overall biological status, with an overall ecological rating of "moderate." Walton-le-Dale WwTW discharges into the River Ribble, a transitional water body. The water body is currently rated "moderate" for overall physico-chemical status and "good" for overall biological status, with an overall ecological rating of "moderate." Wigan (Hoscar) WwTW discharges into the River Yarrow, downstream of Big Lodge Water. The water body is currently rated "good" for overall physico-chemical status and "poor" for overall biological status, with an overall ecological rating of "moderate."

- Where a receiving waterbody does not currently meet good status it is likely that more stringent discharge consents will be needed to ensure good status is met. Any changes to the consent to meet the requirements of the WFD will be promoted through the National Environment Programme (NEP) and agreed and incorporated into United Utilities' five year business plans. Further work will be needed to ensure that growth does not cause deterioration of current water body status and that growth does not make it more difficult to achieve good WFD status.

- In general fluvial and tidal flood risk across the borough is low and flood risk is not considered a barrier to development. However the settlement of Croston has significant flood risk issues and potential development within the settlement could be severely constrained. Over 80% of the settlement area is situated within Flood Zone 2 and 3, with over 8% of that area within Flood Zone 3b, Functional Floodplain. Euxton and its surrounding area have been shown to have been affected by sewer flooding.

10.3 Summary of WCS findings

The outline WCS has not identified any absolute barriers to development in Chorley Borough, although it is recognised that there are some constraints to development which need to be addressed. The findings from the outline WCS are summarised through in Table 10-2 which outlines the key findings and overall assessment for each settlement, and provides an overall summary of the red, amber, green assessment.

Red, amber green	WwTW capacity description	Wastewater network capacity description	Flood Risk	Surface Water Management
RED	No existing capacity at the WwTW and/or there are known planning constraints to additional capacity	Significant existing capacity constraints exist, and require upgrading to accommodate growth	Concerns that there is not sufficient land at low flood risk to accommodate development	Neither inflltration nor attenuation SUDS viable
AMBER	WwTW requires upgrade and there are no known planning issues	Minor upgrades to the sewer system likely to be required to accommodate growth	Flood risk may be a constraint in some parts of the settlements (either within the existing settlement, or on potentially developable land)	Either infiltration or attenuation SUDS viable
GREEN	WwTW has capacity to cater for proposed growth	Sewerage system has capacity to cater for proposed growth. CSO - upstream PE increasing by less than 10% of design PE	Flood risk not considered to be a constraint	Both infiltration and attenuation SUDS viable.

Table 10-1: Criteria for RAG assessment

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Residential sites						
Railway Road	ADL04	Wigan WwTW is a large works so a relatively small proposed increase in flows is not considered a problem. WwTW capacity should not be a constraint to growth. The proposed development is in Adlington at the far end of the catchment and is conveyed to treatment via several on line pumping stations, any of which could have capacity issues. It may be feasible to divert the flow from Adlington Village to the Horwich network , which is geographically much closer, but a detailed study would be required to determine the feasibility of this option.	Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1, Flat, high level land (falling slightly to the north). No recorded flood incidents in the settlement of Aldington. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if agreement is reached on connection point to wastewater network. Agreement with EA required on attenuating runoff to nearby watercourses.
Land off Bolton Rd Baly Place Farm	ADL09	Wigan WwTW is a large works so a relatively small proposed increase in flows is not considered a problem. WwTW capacity should not	Connection point needs to be agreed with developer, which could be agreed through requisition process.	Located in flood zone 1, however flood zone 2 and 3 adjacent to the southern boundary of the site. Flat, high level	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if agreement is reached on connection point to wastewater network. Agreement with EA required

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		be a constraint to growth. The proposed development is in Adlington at the far end of the catchment and is conveyed to treatment via several on line pumping stations, any of which could have capacity issues. It may be feasible to divert the flow from Adlington Village to the Horwich network , which is geographically much closer, but a detailed study would be required to determine the feasibility of this option.		land (falling slightly to the north).		on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high flood risk areas.
Buckshaw Village	BUV01	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The Buckshaw Village development in particular is expected to be problematic in conveying the flow to the works and UU is applying for funding to upsize the sewers in this area as part of their business plan, to be able to accept flows from the Buckshaw Village development. The timescale for this work would be the	Located in flood zone 1. Flat, high level undulating land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on timing of development and network capacity and pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			end of the current AMP (2015). However, there is presently a risk of deterioration due to ongoing growth before the solution can be put into place.			
Buckshaw Village Group 1	BUV02	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The Buckshaw Village development in particular is expected to be problematic in conveying the flow to the works and UU is applying for funding to upsize the sewers in this area as part of their business plan, to be able to accept flows from the Buckshaw Village development. The timescale for this work would be the end of the current AMP (2015). However, there is presently a risk of deterioration due to ongoing growth before the solution can be put into place.	Located in flood zone 1. Undulating land, falls steeply to west. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	Discussion and agreement with UU required on timing of development and network capacity and pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Buckshaw Village Group	BUV03	No known issues with capacity at Chorley WwTW. WwTW capacity should not	The Buckshaw Village development in particular is expected to be problematic in	Located in flood zone 1 on undulating land. Flood risk should not	Superficial Till may prevent infiltration being viable. Reasonable prospects for	Discussion and agreement with UU required on timing of development and network

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
4N		be a constraint to growth.	conveying the flow to the works and UU is applying for funding to upsize the sewers in this area as part of their business plan, to be able to accept flows from the Buckshaw Village development. The timescale for this work would be the end of the current AMP (2015). However, there is presently a risk of deterioration due to ongoing growth before the solution can be put into place.	constrain growth.	attenuation due to nearby watercourses.	capacity and pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Gillibrand	CHO01	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zones 1 and 2. Steep land rising to north and east.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Site specific FRA required. Sequential approach to development. Discussion and agreement with UU required on timing of development and network capacity and pumping station to network. Agreement with EA required on attenuating to nearby watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Crosse Hall Farm	CHO03	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Flood zones 2 and 3 originating from Leeds and Liverpool Canal runing through centre of development site, severely limiting developable land. Steep land falling to the east and west.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Significant flood risk. Only recommended land uses should be developed. Site specific FRA required. Sequential approach to site design required. Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses.
Eaves Green	CHO04	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on steep land, falling down to river. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Park Mills/ Oakwood Road	CHO06	No known issues with capacity at Chorley WwTW. WwTW capacity should not	The limiting factor on development may be the inlet to the pumping station which	Located in flood zone 1 on flat high level land.	Superficial Till may prevent infiltration being viable. Reasonable prospects for	Discussion and agreement with UU required on pumping station to network. Agreement

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		be a constraint to growth.	may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.		attenuation due to nearby watercourse.	with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Talbot Mill	CHO08	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on undulating land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Former Lex Auto Logistics Site, Pilling Lane	CHO10	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are	Located in flood zone 1 on flat high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			being looked at for a sewer upsizing project which is not yet approved.			for development.
Cowling Farm	CHO16	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1. Steep land falling to west from Motorway. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Cowling Mill, Cowling Brow	CHO17	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Proportion of site located within flood zone 2 and 3. Room for development on site, however site design should consider a sequential approach, to steer development to the lowest flood risk	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Site specific FRA required. Sequential approach to site design required. Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses.
William	CHO18	No known issues with	The limiting factor on	Located in flood zone 1	Superficial Till may prevent	Discussion and agreement

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Lawrence Site, Townley Street		capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	on flat high level land. Flood risk should not constrain growth.	infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Quarry Road	CHO25	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on flat high level land. Minor watercourse located to the south of the development site. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
West of Blackburn Road	CHO28	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network	Located in flood zone 1. Steep land falling to west. Potential flood risk from Leeds and Liverpool Canal.	Good prospects for infiltration due to permeable geology. Good prospects for attenuation due to nearby watercourses.	Confirm level of risk from Leeds and Liverpool Canal. Discussion and agreement with UU required on pumping station to network.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.			Agreement with EA required on attenuating runoff to nearby watercourses.
Land at Eaves Green 1	CHO32	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on flat high level land (falling steeply to south).	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Land at Eaves Green 2	CHO33	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not	Located in flood zone 1 on flat high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			yet approved.			
Land behind and west of Blackburn Brow	CHO35	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1. Steep land falling to west. Potential flood risk from Leeds and Liverpool Canal.	Good prospects for infiltration due to permeable geology. Good prospects for attenuation due to nearby watercourses.	Confirm level of risk from Leeds and Liverpool Canal. Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses.
North of Euxton Lane 1	CHO37	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on flat high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
North of Euxton Lane 2	CHO38	No known issues with capacity at Chorley WwTW. WwTW capacity should not	The limiting factor on development may be the inlet to the pumping station which	Located in flood zone 1 on flat high level land. Flood risk should not	Superficial Till may prevent infiltration being viable. Reasonable prospects for	Discussion and agreement with UU required on pumping station to network.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		be a constraint to growth.	may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	constrain growth.	attenuation due to nearby watercourse.	Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Land off Duke Street	CHO45	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on undulating land falling to the east. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Radburn Works, Radburn Brow	CLB02	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No	Flood zones not clearly defined around proposed development site. Potentially at risk of flooding from un-named watercourse.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Surface water should not be routed to wastewater network. All developments in the Walton-le-Dale WwTW catchment need to be assessed by UU. Attenuation SUDS most likely to be viable.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.			Site specific FRA advised to check flood zones.
Land NW of Blainscough Works, Blainscough Lane	COP02	There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water from new developments should be	Located in flood zone 1 on steep land falling to the east. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Surface water should not be routed to wastewater network. All developments in the Croston WwTW catchment need to be assessed by UU. Attenuation SUDS most likely to be viable, however needs detailed check.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.			
Land off Blainscough Lane	COP03	There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water from new developments should be routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.	Located in flood zone 1 on steep land falling to the east. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Surface water should not be routed to wastewater network. All developments in the Croston WwTW catchment need to be assessed by UU. Attenuation SUDS most likely to be viable, however needs detailed check.
Blainscough Works	COP04	There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure	Located in flood zone 1 on flat high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but	Surface water should not be routed to wastewater network. All developments in the Croston WwTW catchment need to be assessed by UU.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	there is no knock on impact on foul flooding or intermittent discharge. No surface water from new developments should be routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.		there may be some nearer non main rivers).	Attenuation SUDS most likely to be viable, however needs detailed check.
Land at Waggon & Horses Public House	COP08	There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water from new developments should be routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.	Located in flood zone 1 on flat high level land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Surface water should not be routed to wastewater network. All developments in the Croston WwTW catchment need to be assessed by UU. Attenuation SUDS most likely to be viable.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Former Woodyard, Station Road	CRO01	There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water from new developments should be routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.	Located in flood zone 2 on undulating level land.	The majority of the site overlies Alluvium where there is good potential for infiltration. In the north of the site superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Site specific FRA required. Sequential approach to site design required. Surface water should not be routed to wastewater network. All developments in the Croston WwTW catchment need to be assessed by UU. Infiltration SUDS most likely to be viable, however needs detailed check.
Sagar House, Langton Brow	ECC01	There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water from new developments should be routed to combined sewer.	Located in flood zone 1 on undulating level land. Flood risk should not constrain growth, however confirm level of flood risk from Syd Brook to the south.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Site specific FRA required to check flood zones. Surface water should not be routed to wastewater network. All developments in the Croston WwTW catchment need to be assessed by UU. Attenuation SUDS most likely to be viable, however needs detailed check. Need agreement from EA regarding

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			Any local improvements required will need to be funded by the developer through the requisition process.			attenuating to watercourses.
Land off Parr Lane	ECC02	There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water from new developments should be routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.	Located in flood zone 1 on undulating level land. Flood risk should not constrain growth.	In the north of the site, both the bedrock and superficial layer are relatively low permeability making infiltration less likely. In the south of the site there may be much more permeable bedrock but the superficial Till could still prevent infiltration. Reasonable prospects for attenuation due to nearby watercourse.	All developments in the Croston WwTW catchment need to be assessed by UU. Attenuation SUDS most likely to be viable, however needs detailed check. Need agreement from EA regarding attenuating to watercourses.
Land at Tincklers Lane	ECC06	There is a major capital scheme at Croston WwTW which is addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact	Located in flood zone 1 on low level flat / undulating land. Flood risk should not constrain growth.	In the north of the site, both the bedrock and superficial layer are relatively low permeability making infiltration less likely. In the south of the site there may be	All developments in the Croston WwTW catchment need to be assessed by UU. Attenuation SUDS most likely to be viable, however needs detailed check. Need

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		flows should not cause an issue once the scheme is complete.	on foul flooding or intermittent discharge. No surface water from new developments should be routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.		much more permeable bedrock but the superficial Till could still prevent infiltration. Good prospects for attenuation due to nearby watercourse.	agreement from EA regarding attenuating to watercourses.
Land to South of Euxton Lane	EUX02	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on steep land falling to the north. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Favourable location for development if agreement is reached on connection point to wastewater network. Agreement with EA required on attenuating runoff to nearby watercourses.
Land off Bournes Row	OTV02	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact	Located in flood zone 1 on undulating land. Flood risk should not constrain growth. However minor watercourse along	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer	Surface water should not be routed to wastewater network. All developments in the Walton-le-Dale WwTW catchment need to be assessed by UU. Attenuation SUDS

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	southern boundary of site.	non main rivers).	most likely to be viable, however needs detailed check.
Land off New Street (1)	OTV04	Croston works has major capital scheme addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No	Located in flood zone 1 on undulating land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourses.	All developments in the Croston WwTW catchment need to be assessed by UU. Attenuation SUDS most likely to be viable. Need agreement from EA regarding attenuating to watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			surface water from new developments should be routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.			
Land off Blackburn Road	OTV06	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable	Located in flood zone 1. Steep land falling to west. Potential flood risk from Leeds and Liverpool Canal.	Where the site is underlain by Glacial Sand and Gravel there is a good prospect for infiltration. Where the site is underlain by superficial Till this may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Check flood risk from Leeds and Liverpool canal. All developments in the Walton-le-Dale WwTW catchment need to be assessed by UU. Attenuation and infiltration SUDS may be to be viable, however needs detailed check. Need agreement from EA regarding attenuating to watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.			
Land North of Town Lane (1)	WLW05	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be	Located in flood zone 1 on steep land falling steeply to south. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable in the south of the site, but it is likely to be possible in the north. Good prospects for attenuation due to nearby watercourse.	All developments in the Walton-le-Dale WwTW catchment need to be assessed by UU. Attenuation and infiltration SUDS may be to be viable, however needs detailed check. Need agreement from EA regarding attenuating to watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			agreed with the Environment Agency. Developers would assume the cost of any mitigation.			
Land to the west of Lucas Lane	WLW07	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would	Located in flood zone 1 on steep land falling steeply to north. Flood risk should not constrain growth, however confirm risk from minor watercourse along north east and west boundary	Superficial Till may prevent infiltration being viable in the south of the site, but it is likely to be possible in the north. Good prospects for attenuation due to nearby watercourse.	All developments in the Walton-le-Dale WwTW catchment need to be assessed by UU. Attenuation and infiltration SUDS may be to be viable, however needs detailed check. Need agreement from EA regarding attenuating to watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			assume the cost of any mitigation.			
Land at Croston's Farm, Lucas Lane	WLW10	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	Located in flood zone 1 on steep land falling steeply to east. Flood risk should not constrain growth, however confirm risk from minor watercourse along west boundary	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Confirm flood risk from minor watercourse. All developments in the Walton-le-Dale WwTW catchment need to be assessed by UU. Attenuation and infiltration SUDS may be to be viable, however needs detailed check. Need agreement from EA regarding attenuating to watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Employment and Mixed Use Land						
Vertex Training and Conference Centre, Little Carr Lane	CHO34	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on flat high level land, however adjacent to flood zones 2 and 3 with risk from River Yarrow	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating runoff to nearby watercourses. Otherwise favourable location for development.
Botany/ Great Knowley Site	ELR1	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on steep land falling steeply to west. Potential risk from Leeds and Liverpool Canal.	South of site good prospects for infiltration due to permeable geology. North of site superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	Confirm flood risk from canal. Discussion and agreement with UU required on pumping station to network. Attenuation and infiltration SUDS may be to be viable. Agreement with EA required on attenuating runoff to nearby watercourses.
M61/ Botany Site	ELR2	No known issues with capacity at Chorley WwTW. WwTW capacity should not	The limiting factor on development may be the inlet to the pumping station which	Located in flood zone 1 on steep land falling steeply to west.	South of site good prospects for infiltration due to permeable geology. North of	Confirm flood risk from canal. Discussion and agreement with UU required on pumping

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		be a constraint to growth.	may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Potential risk from Leeds and Liverpool Canal.	site superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	station to network. Attenuation and infiltration SUDS may be to be viable. Agreement with EA required on attenuating runoff to nearby watercourses.
Group 1 Buckshaw Village	ELR37	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on undulating land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Discussion and agreement with UU required on pumping station to network. Attenuation SUDS most likely to be viable, however needs detailed check.
Southern Commercial Area, Buckshaw Village	ELR38	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are	Located in flood zone 1 on undulating land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Discussion and agreement with UU required on pumping station to network. Attenuation SUDS most likely to be viable, however needs detailed check.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			being looked at for a sewer upsizing project which is not yet approved.			
Regional Investment Sit, Buckshaw Villagee	ELR39	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on undulating land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Discussion and agreement with UU required on pumping station to network. Attenuation SUDS most likely to be viable, however needs detailed check.
East of A49- Safeguarded Land	DC3.8	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised	Located in flood zone 1 on steep land falling to the west. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.			
North of Euxton Lane - Safeguarded Land	DC3.7	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Located in flood zone 1 on undulating land. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Discussion and agreement with UU required on pumping station to network. Agreement with EA required on attenuating to nearby watercourses.
Site 5, 7 and 9, Buckshaw Avenue,	2011	No known issues with capacity at Chorley WwTW. WwTW capacity should not	The limiting factor on development may be the inlet to the pumping station which	In flood zone 1 on flat - high level land (east of the site)/site falls	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse	Attenuation SUDS most likely to be viable, however needs

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Buckshaw Village		be a constraint to growth.	may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	steeply to the south west. Flood risk should not constrain growth.	may be made more difficult due to distance involved (but there may be some nearer non main rivers).	detailed check.
Bolton West Motorway Service Area Northbound	1030	Horwich WwTW is of reasonable capacity and should be able to cope with additional flows. The WwTW is of reasonable capacity, but there are issues regarding effluent ammonia "spikes" and so some improvement to the process may be necessary to maintain compliance	Site acceptable subject to additional sewerage infrastructure being agreed with the developer through the requisition process prior to any permissions being granted.	Located in flood zone 1 on flat - high level land.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	Developer to agree additional sewerage infrastructure requirements with UU. Need agreement from EA on attenuating to nearby watercourses.
Bolton West Motorway Service Area Southbound	1030	Horwich WwTW is of reasonable capacity and should be able to cope with additional flows. The WwTW is of reasonable capacity, but there are issues regarding effluent ammonia "spikes" and so some improvement to the process may be necessary	Site acceptable subject to additional sewerage infrastructure being agreed with the developer through the requisition process prior to any permissions being granted.	Located in flood zone 1 on flat - high level land.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.	Developer to agree additional sewerage infrastructure requirements with UU. Need agreement from EA on attenuating to nearby watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		to maintain compliance				
Golden Acres Ltd, Plocks Farm, Liverpool Road	2004	Croston works has major capital scheme addressing quality and supply demand issues. The design horizon for this scheme is 2031 so increased flows should not cause an issue once the scheme is complete.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water from new developments should be routed to combined sewer. Any local improvements required will need to be funded by the developer through the requisition process.	Located in flood zones 1, 2 and 3 on flat - high level land.	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.	Significant flood risk. Only recommended land uses should be developed. Site specific FRA required. Sequential approach to site design required. Surface water should not be routed to wastewater network. All developments in the Croston WwTW catchment need to be assessed by UU. Infiltration and attenuation SUDS viable.

Table 10-2 Summary of WCS findings for development sites within Chorley Borough

10.4 Conclusions and Recommendations for Chorley Borough

In Chorley, the RSS requirement is to build an additional 7,500 new homes. The WCS has identified potential environmental and infrastructure capacity constraints to development in the Borough and has sought to identify the preferred locations for development from a water cycle perspective.

In this section we have provided recommendations based on the findings of the WCS, and recommendations for further work. Further work can be addressed through a detailed WCS, or alternatively can be carried out as discrete packages of work, as required.

10.4.1 Water resources

There is a predicted supply-demand surplus within the study area until 2022/23, however the local planning authorities should implement planning policies to ensure the efficient use of water in both the new and existing housing and commercial stock (e.g. CSH level 3 and BREEAM excellent standards). The policy for the Central Lancashire Published Core Strategy has been provided, this Policy 29 "Water Management" states: "Improve water quality, water management and reduce the risk of flooding by (a) Minimising the use of potable mains water in new developments." This bullet point in the policy fulfils the duty to promote water efficiency however this is not translated into the actual policy itself which does not specifically mention water efficiency or use of water resources. It is therefore recommended that policies include promotion of water efficiency but are not necessarily restricted to achieving certain levels of CSH at the present time.

UU's current policy on metering includes metering of all new households and non-household properties. In addition to new development, demand must be reduced in the existing housing stock. The local planning authorities, in partnership with the Environment Agency and UU, should continue to encourage the uptake of metering in the existing housing stock, and should encourage more sustainable use of water resources through education programmes, for example.

10.4.2 Flood risk management

Developers need to follow the principles and requirements of national policy, most notably PPS25: Development and Flood Risk. Any new development should be located in the areas of lowest flood risk and must not increase risk to existing development and areas identified as functional floodplain should be protected from development. Where parts of development sites are proposed within Flood Zones 2 and 3, developers should undertake a site-specific Flood Risk Assessment (FRA) to establish the extent of Flood Zones 2, 3a and 3b, and the future risk of climate change. Further modelling may be required to establish these risk areas. Land use within these sectors should be allocated according to the appropriate use as outlined in PPS25.

The Central Lancashire Published Core Strategy Policy 29 "Water Management" should be adhered to in respect of the following points of the policy:

(d) Appraising, managing and reducing flood risk in all new developments, avoiding development in high flood risk areas wherever possible and appropriate, particularly in vulnerable parts of Croston, Penwortham, Walton-le-Dale and southwest Preston.

Sewer flooding has been known to be an issue around Euxton.

Surface water management policies should be developed to ensure that flood risk is not increased within the site or to locations downstream.

It must be ensured that all new development is 'safe,' meaning that dry pedestrian access to and from the development is possible without passing through the 1 in 100 year plus climate change floodplain, and emergency vehicular access is possible.

In Chorley Borough there are flood risk issues which need to be considered when development proposals come forward. The recommendations include:

- Croston is at high risk from fluvial flooding. Development should not be at risk from fluvial flooding and should be prioritised away from areas at higher flood risk. A level 2 SFRA is recommended to further assess flood risk if proposed development is in Flood Zone 2 and 3. The level 2 SFRA should also assess the implication of development behind flood defences, where necessary.

- Where sites contain areas of Flood Zones 1, 2 and 3 development should be steered towards low flood risk areas.

- Residual flood risk from canal breach or overtopping should be assessed by developers as part of a FRA, where development is proposed adjacent to canals.

- There are a number of smaller watercourses in the Borough which have been identified through the WCS, but have not been mapped. Where development is proposed in close proximity to these watercourses, developers should assess the flood risk as part of their FRAs.

10.4.3 Surface water management

The following recommendations are made in light of the findings of the outline WCS:

- As a minimum runoff rates and volumes from the development site should not be greater than runoff rates and volumes prior to development up to the 100 year 6 hour rainfall event (plus an allowance for climate change). In brownfield development sites a reduction of runoff rates and volumes should be achieved compared to the existing rates and volumes. The runoff requirements for a development site should be agreed with the Environment Agency at an early stage in the planning process

- In accordance with PPS25, and the forthcoming Floods and Water Management Bill (and associated national SUDS standards) SUDS are required to be implemented at all scales of development At the household level there should be a presumption away from connecting property extensions or additional hard-standing area to the sewerage network. The additional runoff should be managed at source, where possible, or connected to a watercourse (in agreement with the Environment Agency).

- Infiltration SUDS should be promoted where it is practical. Where infiltration SUDS are not applicable surface water should be discharged to a watercourse (in agreement with the Environment Agency) at a rate no greater than greenfield.

- Where infiltration SUDS are proposed, this must be supported by a groundwater risk assessment, carried out by the developer, to ensure groundwater is not polluted. Groundwater flooding should also be considered where infiltration SUDS are proposed.

- Surface water should not be connected to the sewerage network, unless there is no practicable alternative. Where surface water is required to be connected to the sewerage network, developers need to discuss any potential connections to the sewerage network with UU and the runoff rate from the development site should be controlled to greenfield.

- In greenfield developments there should be no flooding (from all sources) on properties up to the 100 year flood event. This can be achieved through effective master planning of the development site, and may need to include an allowance for managing exceedance flows[18] if surface water drainage infrastructure is exceeded. In brownfield development it may not be possible to achieve this level of protection depending on the nature of the existing risk, but there should be a presumption against building in areas of high risk.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management" the adoption of Sustainable Drainage Systems should be encouraged and Local Authorieis should seek to maximise the potential of Green Infrastructure to contribute to flood relief.

In addition to the recommendations above, the assessment indicates that a combination of infiltration and attenuation based SUDS approaches are likely to be suitable across the Borough. However, the nature of the underlying geology indicates that attenuation SUDS are likely to be most suitable.

In accordance with the Floods and Water Management Act, there should be a preference towards infiltration based SUDS approaches where they are deemed feasible. It is developers' responsibility to assess the suitability of SUDS approaches as part of their drainage planning for development.

10.4.4 Wastewater infrastructure

The following wastewater recommendations based on the findings of the outline WCS:

- Surface water should be kept out of the sewerage network. The removal of the automatic right to connect in the Floods and Water Management Act, will help sewerage undertakers reduce surface water connections to the sewerage network. It is recognised that in some locations there will be no practicable alternative other than connecting surface water to the sewerage network, but it is the

[18] Guidance of managing exceedance flows is provided in "Designing for Exceedance in urban drainage – good practice C635, CIRIA, 2006)

responsibility of the developer to demonstrate that all other possible drainage alternatives have been explored in the first instance.

- Foul flows from new developments can be reduced through implementation of water efficiency measures and metering of all new development. This will reduce the new net burden on the wastewater network and at the WwTW.

- All development proposals should be discussed with UU at the earliest possible opportunity, to understand the constraints for development and potential connection locations to the network and any upgrades required.

- There is hydraulic capacity at Chorley WwTW to accommodate growth. However constraints exist within the network capacity and the Buckshaw Village development in particular is expected to be problematic in conveying the flow to the works. This needs to be discussed with UU if these development sites proceed.

- Increased flow at Croston works should not be an issue until after 2031 when a major capital works scheme is complete. However individual assessments of development sites will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge.

- The developer should discuss any new sewerage infrastructure with UU for developments linking to Horwich WwTW.

- There is a large supply / demand project ongoing at Walton-le-Dale WwTW hence there should not be any capacity issues when this is completed circa 2014. The design horizon increase in capacity should be adequate to accommodate the estimated flow from the dwellings proposed to the year 2026. There are several UID projects ongoing in the catchment. Connections of future developments and transfer of flows would need to be considered on a project by project basis. No surface water should be routed to the wastewater network.

- There is hydraulic capacity at Wigan (Hoscar) WwTW to accommodate growth. However there are local flooding issues in the catchment so consideration of the wastewater network will be needed.

- Within the Chorley and Walton-le-Dale and Wigan WwTWs catchments any connections to the sewerage system need to be discussed with UU.

- Development within upstream areas of pumping stations, entries on the flooding register and combined sewer overflows will need to be further assessed by UU to confirm there is adequate capacity in the wastewater network to accommodate growth, and whether any upgrades are necessary.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management" opportunities to improve the sewer infrastructure should be pursued and the capacity and timing of development should be managed to avoid exceeding sewer infrastructure capacity.

10.4.5 Water quality

The following water quality recommendations based on the findings of the outline WCS:

- In general WwTW which discharge to watercourses with a higher dilutive capacity should be considered preferable for growth, because the WwTW will have a lower impact on the watercourse.

- Growth must not cause deterioration of water quality and should not hinder the ability of a water body to meet the WFD.

- Early discussions should take place between the Environment Agency, the local planning authority and UU to confirm the new consents needed to serve growth.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management Local Authorities should work with the regional water company and other partners to promote investment in sewage water treatment works to reduce the risk of river pollution from sewage discharges.

- The study has identified WwTW catchments where there are concerns that development may cause capacity issues either at the WwTW or throughout the network. Further assessments of sustainable drainage strategies will be required in these locations. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure and to avoid any deterioration of water quality.

- In general WwTW which discharge to watercourses with a higher dilutive capacity should be considered preferable for growth, because the WwTW will have a lower impact on the watercourse.

- If actual development differs from the proposed development used for this WCS, Chorley Borough Council should consult with the Environment Agency to identify whether a WwTW will require a new consent to support growth, and if so the nature of the consent.

11 South Ribble Borough

11.1 Introduction

This chapter provides a summary of the key findings from the outline WCS and a list of recommendations for South Ribble Borough.

11.2 Overview of key issues

The key issues and constraints from the outline WCS are identified below.

- There is hydraulic capacity at Chorley WwTW to accommodate growth. However the limiting factor on development may be the inlet to the pumping station which may need to be reviewed. Flow to Chorley is constrained by the network capacity; plans are being looked at for a sewer upsizing project which is not yet approved. The Buckshaw Village development in particular is expected to be problematic in conveying the flow to the works. For other developments UU would need to carefully consider the connection point to the network.

- There is a capital maintence scheme ongoing at Leyland WwTW at present to improve compliance issues with respect to the limit on ammoniacal nitrogen, but this will not provide any further capacity. This maintenance scheme will report in 2012. This scheme does not have a future maintenance design horizon but will assist with current problems. There is projected development of approximately 2500 dwellings by the year 2026, and the treatment works will not be able to accommodate this additional load, either within its consented flow or the existing treatment units. United Utilities has a proposal to divert the flow from a significant development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available. The remaining, smaller developments can be accommodated at Leyland WwTW, although it would be necessary to agree a suitable point of connection into the network to avoid increasing the spill frequency of existing CSOs. There are also network flooding issues in the Leyland catchment and points of connection would need careful review by UU. Surface water should not be routed into the wastewater network.

- If flow from the Pickerings Farm (Central Lancashire Urban Village) development were routed to Longton then it is likely that the WwTW and the network would need upgrading. There is, however a constraint with respect to the network, as the sewer which would receive this flow has flooding problems, and has no capacity to receive additional growth. It may therefore be necessary to undertake reinforcement, or to provide a new rising main to convey any additional flow directly to the treatment works. However the Pickering's Farm site could be accommodated at the Preston (Clifton marsh) WwTW.

- There is a large supply / demand project ongoing at Walton-le-Dale WwTW hence there should not be any capacity issues when this is completed circa 2014. The design horizon increase in capacity should be adequate to accommodate the estimated flow from the dwellings proposed to the year 2026. There are several UID projects ongoing in the catchment. Connections of future developments and transfer of flows would need to be considered on a project by project basis. No surface water should be routed to the wastewater network.

- The geology underlying South Ribble Borough is highly permeable, and it is therefore deemed to have a higher potential for infiltration SUDS. However, the high permeability of the rock means that it is in use as a water resource. The SPZ indicate boreholes which need to be protected. Therefore, whilst infiltration SUDS should be largely applicable, due consideration should be given to the presence of SPZs when determining whether infiltration SUDS are likely to be applicable. Much of South Ribble has superficial deposits of Till which is indicated as Unproductive Strata (i.e. non aquifer). In these areas, the low permeability of the overlying Till layer may prevent infiltration SUDS being feasible, even where the bedrock is more permeable. In these areas therefore, attenuation based SUDS will generally be more applicable.

- South Ribble Borough lies within the Integrated Water Resource Zone (WRZ). There is a positive supply-demand balance in water supply until 2022/23. UU has identified that there will be a deficit in water supply from 2022/23 and this can be addressed by leakage reduction and water efficiency measures until 2025. UU has identified that this deficit from 2022 onwards can mostly be provided by increasing supply sources. However planning requirements to use water more efficiently now would reduce the reliance on new water sources, especially as climate change impacts on these sources are unknown. The population of the study areas of the WCS represents a small proportion of the total population for the Integrated WRZ. The number of new households estimated between 2006 and 2035 represents a small proportion of the total number of new households in the Integrated WRZ as a whole. Thus any additional demand for water from new properties in the Blackpool and Central Lancashire areas in future will represent only a very small proportion of the total demand for the WRZ.

- The policy for the Central Lancashire Published Core Strategy has been provided, this Policy 29 "Water Management" states: "Improve water quality, water management and reduce the risk of flooding by:

    q) Minimising the use of potable mains water in new developments;

    r) Working with the regional water company and other partners to promote investment in sewage water treatment works to reduce the risk of river pollution from sewage discharges;

    s) Working with farmers to reduce run-off polluted with agricultural residues into watercourses;

    t) Appraising, managing and reducing flood risk in all new developments, avoiding development in high flood risk areas wherever possible and appropriate, particularly in vulnerable parts of Croston, Penwortham, Walton-le-Dale and southwest Preston;

u) Pursuing opportunities to improve the sewer infrastructure, particularly in Grimsargh, Walton-le-Dale and Euxton, due to the risk of sewer flooding;

v) Managing the capacity and timing of development to avoid exceeding sewer infrastructure capacity;

w) Encouraging the adoption of Sustainable Drainage Systems;

x) Seeking to maximise the potential of Green Infrastructure to contribute to flood relief.

- Chorley WwTW discharges into the River Yarrow, downstream of Big Lodge Water. The water body is currently rated "good" for overall physico-chemical status and "poor" for overall biological status, with an overall ecological rating of "moderate." Leyland WwTW discharges into the River River Lostock downstream of Farington Weir. The water body is currently rated "moderate" for overall physico-chemical status and "poor" for overall biological status, with an overall ecological rating of "poor." Longton WwTW discharges into Tarra Carr Gutter. The water body is currently rated "moderate" for overall physico-chemical status and "bad" for overall biological status, with an overall ecological rating of "moderate." Walton-le-Dale WwTW discharges into the River Ribble, a transitional water body. The water body is currently rated "moderate" for overall physico-chemical status and "good" for overall biological status, with an overall ecological rating of "moderate."

- Where a receiving waterbody does not currently meet good status it is likely that more stringent discharge consents will be needed to ensure good status is met. Any changes to the consent to meet the requirements of the WFD will be promoted through the National Environment Programme (NEP) and agreed and incorporated into United Utilities' five year business plans. Further work will be needed to ensure that growth does not cause deterioration of current water body status and that growth does not make it more difficult to achieve good WFD status.

- It is not considered that flood risk will be a barrier to development, because there is sufficient land at low flood risk to allow development to occur outside of flood risk areas. The highest flood risk in the Borough is in Walton-le-Dale with approximately 50% of development area within Flood Zone 2 and 3 and Higher Walton where almost 50% of the settlement is located within Flood Zone 3b, Functional Floodplain.

11.3 Summary of WCS findings

The outline WCS has not identified any absolute barriers to development in South Ribble, although it is recognised that there are some constraints to development which need to be addressed. The findings from the outline WCS are summarised through in Table 11-2 (grouped by location at the request of South Ribble Borough) which outlines the key findings and overall assessment for each settlement, and provides an overall summary of the red, amber, green assessment.

Red, amber green	WwTW capacity description	Wastewater network capacity description	Flood Risk	Surface Water Management
RED	No existing capacity at the WwTW and/or there are known planning constraints to additional capacity	Significant existing capacity constraints exist, and require upgrading to accommodate growth	Concerns that there is not sufficient land at low flood risk to accommodate development	Neither inflitration nor attenuation SUDS viable
AMBER	WwTW requires upgrade and there are no known planning issues	Minor upgrades to the sewer system likely to be required to accommodate growth	Flood risk may be a constraint in some parts of the settlements (either within the existing settlement, or on potentially developable land)	Either infiltration or attenuation SUDS viable
GREEN	WwTW has capacity to cater for proposed growth	Sewerage system has capacity to cater for proposed growth. CSO - upstream PE increasing by less than 10% of design PE	Flood risk not considered to be a constraint	Both infiltration and attenuation SUDS viable.

Table 11-1 Criteria for RAG assessment

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Bamber Bridge, Residential Sites						
Wesley Street Mill	BBE1	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	Flat, high level land in Flood zone 1. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Safeguarded site c, Brindle Road	BBE7	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	Flat, high level land in Flood zone 1. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.
Arla Dairies, School Lane	BBN2	Large project on-going at Walton-le-Dale WwTW so	No known absolute barriers to development. Individual	Flat, high level land (falling slightly to west)	Low permeability geology in west of sites makes	Favourable location for development if surface water

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		capacity should not be an issue.	assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	in Flood Zone 1. Flood risk should not constrain growth.	infiltration less likely. In the east of the site, superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.
Brownedge Road	BBW2	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be	Flat, high level land in Flood zone 1. Flood risk should not	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good	Favourable location for development if surface water runoff not routed to sewer system.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	constrain growth.	prospects for attenuation due to nearby watercourse.	Agreement with EA required on attenuating runoff to nearby watercourses.
Land at Riverside/ Lostock Lane	BBW7	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact	Steep land running down to River Lostock. Parts of site in flood zones 1 and 2. Sequential approach to	Infiltration prospects are good due to permeable geology. Also good prospects for attenuation due to nearby watercourse.	Surface water runoff should not be routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	site design required.		Site specific FRA should steer development away from high flood risk areas.
Brindle Road (site m)	LPm	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No	Undulating - rising to the east entirely within Flood Zone 1. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.			
Kellet Lane (site k)	LPk	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network.	Undulating land rising steeply beyond the site to the south in Flood Zone 1. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.			
Bamber Bridge, Mixed Use / Employment Sites						
South Rings	SRE09	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network.	Flat, high level land in Flood Zone 1. Flood risk should not constrain growth.	Infiltration prospects are good due to permeable geology. Also good prospects for attenuation due to nearby watercourse.	Favourable location for development if UU assessment confirms this. No other constraints identified.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.			
Charnock / Tardy Gate, Residential Sites						
Safeguarded site A, Southern Part	CH2	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a constraint to growth.	There are constraints within the network therefore no surface water should be routed to the network. An ongoing assessment is being undertaken by UU.	Undulating land falling to east in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.
Lostock Hall	TG3	Large project on-going at	No known absolute barriers	Undulating land in	Both the bedrock and	Site specific FRA should steer

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Gas Works, Leyland Road		Walton-le-Dale WwTW so capacity should not be an issue.	to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	Flood zones 1 and 2. Sequential approach to site design required.	superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	development away from high flood risk areas. Favourable location for development if UU assessment confirms this. Agreement with EA required for attenuation to watercourse.
Lime Kiln Farm (Site h), Todd Lane	TG6	Large project on-going at Walton-le-Dale WwTW so capacity should not be an	No known absolute barriers to development. Individual assessments of development	Undulating land in Flood Zone 1. Flood risk should not	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock)	Favourable location for development if surface water runoff not routed to sewer

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
North		issue.	site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	constrain growth.	and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	system. Agreement with EA required on attenuating runoff to nearby watercourses.
South Part of allocation f, east of Leyland Road	TG7	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure	Undulating land in flood zones 1 and 2. Sequential approach to site design required.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.		to nearby watercourse.	on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high flood risk areas.
Farington, Residential Sites						
Safeguarded site d, Flensburg Way	FW2	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area,	Flat, high level land in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due	Favourable location for development if UU assessment confirms this. Surface water should not be routed to sewer network.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		but this will not provide any further capacity.	either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.		to nearby watercourse.	Agreement with EA required for attenuation to watercourse.
West of Grasmere Avenue (Site c), Grasmere Avenue	FW7	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to	Steep land falling to the west in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.			flood risk areas.
Farington Park, east of Wheelton Lane	FW9	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow	Flat, high level land in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if UU assessment confirms this. Agreement with EA required for attenuation to watercourse.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.			
Roadferry	FW12	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013)	Flat, high level land in Flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high flood risk areas.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			where capacity will be available.			
Brackenhouse Properties (site c)	LPc	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.	Undulating land in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.
Farington, Mixed use / Employment Sites						
Regional	SRE08	There is a capital	The Leyland WwTW will not	Undulating land falling	In the south, the superficial	Favourable location for

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Investment Site, Cuerden		maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.	to east in Flood Zone 1. Flood risk should not constrain growth.	Till may prevent infiltration being viable, but in the north infiltration prospects are good. Good prospects for attenuation due to nearby watercourse.	development if UU assessment confirms this. Surface water should not be routed to sewer network. Agreement with EA required for attenuation to watercourse.
Penwortham, Mixed Use / Employment Sites						
Pickerings Farm (Central Lancashire Urban Village)	SRE02	No issues identified with capacity at Preston (Clifton Marsh) WwTW. WwTW capacity should not be a	There are constraints within the Preston WwTW network therefore no surface water should be routed to the network. An ongoing	Undulating land in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for	Favourable location for development if UU assessment confirms this. Agreement with EA required

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		constraint to growth. If all fows from this development are routed Longton WwTW then it is likely that the WwTW and the network would need upgrading.	assessment being undertaken by UU at Preston WwTW. For Longton there is a constraint with respect to the network capacity, as the sewer which would receive this flow has recorded incidents of external flooding, and has no capacity to receive additional growth. It may therefore be necessary to undertake reinforcement, or to provide a new rising main to convey any additional flow directly to the treatment works.		attenuation due to nearby watercourse.	for attenuation to watercourse.
Leyland, Residential Sites						
Former Prestolite premises, Golden Hill Lane	GH4	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need	Flat, high level land in Flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.			flood risk areas.
Group One, Buckshaw	LSA4	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Undulating land falling to south in Flood Zone 1. Flood risk should not constrain growth.	Low permeability geology in north of sites makes infiltration less likely. In the south of the site, superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if pumping station capacity confirmed. Agreement with EA required for attenuation to watercourse.
Parcel A3, Buckshaw	LSA7	No known issues with capacity at Chorley WwTW. WwTW capacity should not	The limiting factor on development may be the inlet to the pumping station which	Located in Flood Zone 1. Flood risk should not	Superficial Till may prevent infiltration being viable. Reasonable prospects for	Favourable location for development if pumping

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Village		be a constraint to growth.	may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	constrain growth.	attenuation due to nearby watercourse.	station capacity confirmed. Agreement with EA required for attenuation to watercourse.
Slater Lane/Expac	LPo	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel	Flat - low level land in Flood zones 1 and 2. Sequential approach to site design required.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse.	Surface water runoff should not be routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high flood risk areas.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			(to be completed in 2013) where capacity will be available.			
Safeguarded site e, Wade Hall	LOW1	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.	Steep land falling to west. Parts of the site are in Flood Zones 1, 2 and 3. Sequential approach to site design required.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse.	Site specific FRA should steer development away from high flood risk areas. Favourable location for development if UU assessment confirms this. Agreement with EA required for attenuation to watercourse.
Leyland, Mixed use / Employment Sites						

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Safeguarded Site i, Leyland Lane	SRE01	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.	Flat, low level land in Flood Zone 1 and 2. Sequential approach to site design required.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse.	Site specific FRA should steer development away from high flood risk areas. Favourable location for development if UU assessment confirms this. Agreement with EA required for attenuation to watercourse.
Moss Side Test Track (NE Portion), employment land	SRE05	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area,	Flat, low level land in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		but this will not provide any further capacity.	either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.		making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse.	on attenuating runoff to nearby watercourses.
Brackenhouse	SRE11	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to	Flat, high level land in Flood Zone 1 and 2. Sequential approach to site design required.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Site specific FRA should steer development away from high flood risk areas. Favourable location for development if UU assessment confirms this. Agreement with EA required for attenuation to watercourse.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be available.			
Aldi Site, Matrix Park	SRE12	No known issues with capacity at Chorley WwTW. WwTW capacity should not be a constraint to growth.	The limiting factor on development may be the inlet to the pumping station which may need to be reviewed by UU. Flow to Chorley WwTW is constrained by the network capacity; there are significant network issues, and plans are being looked at for a sewer upsizing project which is not yet approved.	Flat, high level land in Flood Zone 1. Flood risk should not constrain growth.	Low permeability geology in north of sites makes infiltration less likely. In the south of the site, superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.	Favourable location for development if pumping station capacity confirmed. Agreement with EA required for attenuation to watercourse.
Samlesbury and Walton, Residential Sites						
The Foundry, Kittlingborne	SW13	Large project on-going at Walton-le-Dale WwTW so	No known absolute barriers to development. Individual	Steep land falling down to Wier. Areas of site in	Good prospects for infiltration due to permeable	Site specific FRA should steer development away from high

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Brow		capacity should not be an issue.	assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	Flood Zones 1 and 3. Sequential approach to site design required.	geology. Good prospects for attenuation due to nearby watercourse.	flood risk areas. Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.
Higher Walton Mills, Blackburn Road	SW14	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be	Steep land falling to east. Areas of site in Flood Zones 1, 2 and 3. Sequential approach to	Good prospects for infiltration due to permeable geology. Good prospects for attenuation due to nearby	Favourable location for development if surface water runoff not routed to sewer system.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.	site design required.	watercourse.	Agreement with EA required on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high flood risk areas.
Church Lane (site h)	LPh	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact	Flat, high level land in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.		Reasonable prospects for attenuation due to nearby watercourse.	nearby watercourses.
Samlesbury and Walton, Mixed Use / Employment Sites						
BAE Systems, Samlesbury	SRE07	UU has indicated that Blackburn WwTW presently has spare capacity, but it has been noted that there is unused capacity within the trade effluent	No constraints identified at this stage.	Undulating land falling to east in Flood Zone 1. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer	Maybe constraints to use of SUDS if no near non main rivers to site. Otherwise no other constraints identified.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		consent of a brewery located within the WwTW catchment, and if they were to exploit this capacity, the treatment works would be fully loaded.			non main rivers).	
Middleforth, Residential Sites						
Safeguarded site a north part, South of Factory Lane	MF1	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable	Steep land falling to west in Flood Zone 2.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Significant flood risk. Only recommended land uses should be developed. Site specific FRA should steer development away from high flood risk areas. Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high flood risk areas.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			deterioration. The developer's models would have to be agreed with the Environment Agency. Developers would assume the cost of any mitigation.			
Vernon Carus Site, Factory Lane	MF2	Large project on-going at Walton-le-Dale WwTW so capacity should not be an issue.	No known absolute barriers to development. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. No surface water to be routed to the sewer network. UU suggests that developers undertake their own localised modelling of flow from the development to the point of connection to the wastewater network. UU could then use this within their own models and advise in light of understanding of acceptable deterioration. The developer's models would have to be	Located in Flood Zones 2 and 3 on steep land falling to the east. Sequential approach to site design required.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses. Site specific FRA should steer development away from high flood risk areas.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			agreed with the Environment Agency. Developers would assume the cost of any mitigation.			
Moss Side, Residential Sites						
Moss Side Test Track, Aston Way	MS2	There is a capital maintenance scheme ongoing at present to improve compliance issues (NH3) at Leyland WwTW but this will not provide any further capacity.	The Leyland WwTW will not be able to accommodate the additional load from all of the potential developments within it's catchment area, either within its consented flow or the existing treatment units. Individual assessments of development site will need to be undertaken by UU to ensure there is no knock on impact on foul flooding or intermittent discharge. United Utilities has a proposal to divert the flow from development to the North of the catchment into the Preston (Clifton Marsh) catchment, via a new tunnel (to be completed in 2013) where capacity will be	Flat, low level land in Flood Zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if UU assessment confirms this. Surface water should not be routed to sewer network. Agreement with EA required for attenuation to watercourse.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			available.			
New Longton & Hutton East, Residential Sites						
Schoolhouse Farm Development, Liverpool Road	NLH1	Longton WwTW capacity needs to be confirmed. WwTW is currently being improved but should be able to accommodate increased flow. Assessment of capacity could be handled at application stage.	There is a constraint with respect to the network capacity, as the sewer which would receive this flow has recorded incidents of external flooding, and has no capacity to receive additional growth. It may therefore be necessary to undertake reinforcement, or to provide a new rising main to convey any additional flow directly to the treatment works.	Flat, low level land in Flood Zone 1. Flood risk should not constrain growth.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.	Favourable location for development if surface water runoff not routed to sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.

Table 11-2 Summary of WCS findings for development sites in South Ribble Borough

11.4 Conclusions and Recommendations for South Ribble Borough

In South Ribble Borough, the RSS requirement is to build an additional 7,500 new homes. The WCS has identified potential environmental and infrastructure capacity constraints to development in the Borough and has sought to identify the preferred locations for development from a water cycle perspective.

In this section we have provided recommendations based on the findings of the WCS, and recommendations for further work. Further work can be addressed through a detailed WCS, or alternatively can be carried out as discrete packages of work, as required.

11.4.1 Water resources

There is a predicted supply-demand surplus within the study area until 2022/23, however the local planning authorities should implement planning policies to ensure the efficient use of water in both the new and existing housing and commercial stock (e.g. CSH level 3 and BREEAM excellent standards). The policy for the Central Lancashire Published Core Strategy has been provided, this Policy 29 "Water Management" states: "Improve water quality, water management and reduce the risk of flooding by (a) Minimising the use of potable mains water in new developments." This bullet point in the policy fulfils the duty to promote water efficiency however this is not translated into the actual policy itself which does not specifically mention water efficiency or use of water resources. It is therefore recommended that policies include promotion of water efficiency but are not necessarily restricted to achieving certain levels of CSH at the present time.

UU's current policy on metering includes metering of all new households and non-household properties. In addition to new development, demand must be reduced in the existing housing stock. The local planning authorities, in partnership with the Environment Agency and UU, should continue to encourage the uptake of metering in the existing housing stock, and should encourage more sustainable use of water resources through education programmes, for example.

11.4.2 Flood risk management

Developers need to follow the principles and requirements of national policy, most notably PPS25: Development and Flood Risk. Any new development should be located in the areas of lowest flood risk and must not increase risk to existing development and areas identified as functional floodplain should be protected from development. Where parts of development sites are proposed within Flood Zones 2 and 3, developers should undertake a site-specific Flood Risk Assessment (FRA) to establish the extent of Flood Zones 2, 3a and 3b, and the future risk of climate change. Further modelling may be required to establish these risk areas. Land use within these sectors should be allocated according to the appropriate use as outlined in PPS25.

The Central Lancashire Published Core Strategy Policy 29 "Water Management" should be adhered to in respect of the following points of the policy:

(d) Appraising, managing and reducing flood risk in all new developments, avoiding development in high flood risk areas wherever possible and appropriate, particularly in vulnerable parts of Croston, Penwortham, Walton-le-Dale and southwest Preston.

Surface water and sewer flooding does not appear to be a significant issue within South Ribble Borough, however appropriate surface water management policies should be developed to ensure that flood risk is not increased within the site or to locations downstream.

It must be ensured that all new development is 'safe,' meaning that dry pedestrian access to and from the development is possible without passing through the 1 in 100 year plus climate change floodplain, and emergency vehicular access is possible.

It may be possible to cluster potential development areas together to consider strategic flood risk management activities that would provide a strategic benefit and bring benefit to the wider community.

In South Ribble Borough there are flood risk issues which need to be considered when development proposals come forward. The recommendations include:

- Development within Flood Zone 2 should be restricted to the 'water compatible', 'less vulnerable' and 'more vulnerable' category (see Tables D.1-D.3 in PPS25 for definitions). Development within High Probability Flood Zone 3a should be restricted to the water compatible or 'less vulnerable' uses to satisfy the requirements of the Sequential Test.

- Flood risk should not be a constraint to development in the rural settlements, with the exception of Higher Walton which has considerable flood risk present. Development within Higher Walton in Flood Zone 3b should be restricted to 'water-compatible uses' and 'essential infrastructure' that has to be there. Table D2 from PPS 25 outlines the types of development included within this classification.

- Where sites contain areas of Flood Zones 1, 2 and 3 development should be steered towards low flood risk areas.

- Residual flood risk from canal breach or overtopping should be assessed by developers as part of a FRA, where development is proposed adjacent to canals.

- There are a number of smaller watercourses in the Borough which have been identified through the WCS, but have not been mapped. Where development is proposed in close proximity to these watercourses, developers should assess the flood risk as part of their FRAs.

- A level 2 SFRA is recommended should development be proposed in Higher Walton, as approximately 50% of the settlement is located within Flood Zones 2 and 3.

11.4.3 Surface water management

The following recommendations are made in light of the findings of the outline WCS:

- As a minimum runoff rates and volumes from the development site should not be greater than runoff rates and volumes prior to development up to the 100 year 6 hour rainfall event (plus an allowance for climate change). In brownfield development sites a reduction of runoff rates and volumes should be achieved compared to the existing rates and volumes. The runoff requirements for a development site should be agreed with the Environment Agency at an early stage in the planning process

- In accordance with PPS25, and the forthcoming Floods and Water Management Bill (and associated national SUDS standards) SUDS are required to be implemented at all scales of development At the household level there should be a presumption away from connecting property extensions or additional hard-standing area to the sewerage network. The additional runoff should be managed at source, where possible, or connected to a watercourse (in agreement with the Environment Agency).

- Infiltration SUDS should be promoted where it is practical. Where infiltration SUDS are not applicable surface water should be discharged to a watercourse (in agreement with the Environment Agency) at a rate no greater than greenfield.

- Where infiltration SUDS are proposed, this must be supported by a groundwater risk assessment, carried out by the developer, to ensure groundwater is not polluted. Groundwater flooding should also be considered where infiltration SUDS are proposed. The presence of Source Protection Zones (SPZs) and nitrate vulnerable zones must also be considered as part of the development proposal.

- Surface water should not be connected to the sewerage network, unless there is no practicable alternative. Where surface water is required to be connected to the sewerage network, runoff rate from the development site should be controlled to greenfield

- In greenfield developments there should be no flooding (from all sources) on properties up to the 100 year flood event. This can be achieved through effective master planning of the development site, and may need to include an allowance for managing exceedance flows[19] if surface water drainage infrastructure is exceeded. In brownfield development it may not be possible to achieve this level of protection depending on the nature of the existing risk, but there should be a presumption against building in areas of high risk.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management" the adoption of Sustainable Drainage Systems should be encouraged and Local Authorieis should seek to maximise the potential of Green Infrastructure to contribute to flood relief.

In addition to the recommendations above, the assessment indicates that a combination of infiltration and attenuation based SUDS approaches are likely to be suitable across the Borough. Examples of infiltration and attenuation based SUDS are given in Section 3.3.1.

In accordance with the Floods and Water Management Act, there should be a preference towards infiltration based SUDS approaches where they are deemed feasible. It is developers' responsibility to assess the suitability of SUDS approaches as part of their drainage planning for development.

[19] Guidance of managing exceedance flows is provided in "Designing for Exceedance in urban drainage – good practice C635, CIRIA, 2006)

11.4.4 Wastewater infrastructure

The following wastewater recommendations based on the findings of the outline WCS:

- Surface water should be kept out of the sewerage network, where possible. The removal of the automatic right to connect in the Floods and Water Management Act, will help sewerage undertakers reduce surface water connections to the sewerage network. It is recognised that in some locations there will be no practicable alternative other than connecting surface water to the sewerage network, but it is the responsibility of the developer to demonstrate that all other possible drainage alternatives have been explored in the first instance.

- Foul flows from new developments can be reduced through implementation of water efficiency measures and metering of all new development. This will reduce the new net burden on the wastewater network and at the WwTW.

- All development proposals should be discussed with UU at the earliest possible opportunity, to understand the constraints for development and potential connection locations to the network and any upgrades required.

- There is hydraulic capacity at Chorley WwTW to accommodate growth. However constraints exist within the network capacity. Surface water should be kept out of the wastewater network. Developments need to be discussed with UU.

- Developments in the Leyland catchment need to be discussed with UU. There are concerns about the capacity at Leyland WwTW and there are also network flooding issues in the Leyland catchment and points of connection to the network would need careful review by UU. Surface water should be kept out of the wastewater network.

- Longton WwTW has hydraulic capacity to accommodate growth. Surface water should be kept out of the wastewater network.

- There is a large supply / demand project ongoing at Walton-le-Dale WwTW hence there should not be any capacity issues when this is completed circa 2014. The design horizon increase in capacity should be adequate to accommodate the estimated flow from the dwellings proposed to the year 2026. There are several UID projects ongoing in the catchment. Connections of future developments and transfer of flows would need to be considered on a project by project basis. No surface water should be routed to the wastewater network.

- Within the Chorley and Walton-le-Dale WwTWs catchments any connections to the sewerage system need to be discussed with UU. Surface water should be kept out of the wastewater network.

- Development within upstream areas of pumping stations, entries on the flooding register and combined sewer overflows will need to be further assessed by UU to confirm there is adequate capacity in the wastewater network to accommodate growth, and whether any upgrades are necessary.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management" opportunities to improve the sewer infrastructure should be pursued and the capacity and timing of development should be managed to avoid exceeding sewer infrastructure capacity.

11.4.5 Water quality

The following recommendations are made in light of the findings of the outline WCS:

- In general WwTW which discharge to watercourses with a higher dilutive capacity should be considered preferable for growth, because the WwTW will have a lower impact on the watercourse.

- Growth must not cause deterioration of water quality and should not hinder the ability of a water body to meet the WFD.

- Early discussions should take place between the Environment Agency, the local planning authority and UU to confirm the new consents needed to serve growth.

- In accordance with the Central Lancashire Published Core Strategy Policy 29 "Water Management Local Authorities should work with the regional water company and other partners to promote investment in sewage water treatment works to reduce the risk of river pollution from sewage discharges.

- The study has identified WwTW catchments where there are concerns that development may cause capacity issues either at the WwTW or throughout the network. Further assessments of sustainable drainage strategies will be required in these locations. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure and to avoid any deterioration of water quality.

- In general WwTW which discharge to watercourses with a higher dilutive capacity should be considered preferable for growth, because the WwTW will have a lower impact on the watercourse.

- If actual development differs from the proposed development used for this WCS, South Ribble Borough Council should consult with the Environment Agency to identify whether a WwTW will require a new consent to support growth, and if so the nature of the consent.

12 Blackpool Borough

12.1 Introduction

This chapter provides a summary of the key findings from the outline WCS and a list of recommendations for Blackpool Borough.

12.2 Overview of key issues

The key issues and constraints from the outline WCS are identified below.

- There is hydraulic capacity at Fleetwood Marsh WwTW to accommodate growth. However there are major network capacity issues in the Blackpool and Fleetwood catchments. UU is looking at ways in which surface water can be taken out of the system to increase the capacity for foul flows.

- With a potential main focus for strategic levels of new development within Blackpool at Marton Moss and on the edge of Blackpool in Fylde as part of the wider M55 Hub, no further development should be permitted beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole.

- Until such time as the ongoing assessment by UU and partners leads to a strategic drainage solution for Blackpool, each development application will need to be assessed in detail in isolation, in consultation with United Utilities.

- Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce or prohibit the amount of surface water being discharged into the combined sewer system.

- There are Secondary Aquifers within the Borough which may be suitable for infiltration SUDS. For superficial deposit aquifers in particular, the suitability for SUDS will also be highly dependant on local conditions, such as depth to groundwater since high groundwater levels could prevent effective infiltration. However much of Blackpool has superficial deposits of Till which is indicated as Unproductive Strata (i.e. non aquifer). In these areas, the low permeability of the overlying Till layer may prevent infiltration SUDS being feasible, even where the bedrock is more permeable. In these areas therefore, attenuation based SUDS will generally be more applicable.

- Blackpool lies within the Integrated Water Resource Zone (WRZ). There is a positive supply-demand balance in water supply until 2022/23. UU has identified that there will be a deficit in water supply from 2022/23 and this can be addressed by leakage reduction and water efficiency measures until 2025. UU has identified that this deficit from 2022 onwards can mostly be provided by increasing supply sources. However planning requirements to use water more efficiently now would reduce the reliance on new water sources, especially as climate change impacts on these sources are unknown. The population of the study areas of the WCS represents a small proportion of the total population for the Integrated WRZ. The number of new households estimated between 2006 and 2035 represents a small proportion of the total number of new households in the Integrated WRZ as a whole. Thus any additional demand for water from new properties in the Blackpool and Central Lancashire areas in future will represent only a very small proportion of the total demand for the WRZ.

- The Blackpool Core Strategy Preferred Option, November 2010 recognises that "Sustainable natural resource management within Blackpool means ensuring greater efficiency in our use of natural resources." However this is stated in relation to Policy S7 "Climate Change and Sustainable Development" and Policy M5 "Neighbourhood Character, Marton Moss/ M5 hub" which do then not specifically make reference to water efficiency measures. It is debatable whether this fulfils the duty to promote water efficiency and it is therefore recommended that in the short-term policies are updated to include specific mention of the promotion of water efficiency. It is not necessary to restrict new development to achieving certain levels of CSH at the present time but policy makers should again be mindful of the Government's Building a Greener Future Policy and potential changes to the Building Regulations which may require policy to be updated and strengthen in the medium to long term.

- Fleetwood Marsh WwTW discharges into the Wyre which is a transitional water body. The water body is currently rated "moderate" for overall physico-chemical status and "high" for overall biological status, with an overall ecological rating of "moderate." Where a receiving waterbody does not currently meet good status it is likely that more stringent discharge consents will be needed to ensure good status is met. Any changes to the consent to meet the requirements of the WFD will be promoted through the National Environment Programme (NEP) and agreed and incorporated into United Utilities' five year business plans. Further work will be needed to ensure that growth does not cause deterioration of current water body status and that growth does not make it more difficult to achieve good WFD status. If a deterioration in terms of spill frequency is unacceptable, development which would cause any significant deterioration cannot proceed until United Utilities are able to identify and undertake separation of surface water at least equivalent to the projected increase in foul flow

- It is not considered that flood risk will be a barrier to development, because there is sufficient land at low flood risk to allow development to occur outside of flood risk areas. Within Blackpool there are some flood risk constraints in Anchorsholme and Thornton. There are no areas within Blackpool within Flood Zone 3b, Functional Floodplain. There are surface water and sewer flooding issues in Anchorsholme and Marton Moss due to reliance on and inundation of the public sewerage system. New development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these towns.

12.3 Summary of WCS findings

The outline WCS has identified that there is a barrier to development in Blackpool, namely the capacity of the wastewater network. It is therefore recommended that, with a potential main focus for strategic levels of new development within Blackpool at Marton Moss and on the edge of Blackpool in Fylde as part of the wider M55 Hub, no further development should be permitted beyond existing allocated sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole.

The findings from the outline WCS are summarised through in Table 12-2 which outlines the key findings and overall assessment for each settlement, and provides an overall summary of the red, amber, green assessment.

Red, amber green	WwTW capacity description	Wastewater network capacity description	Flood Risk	Surface Water Management
RED	No existing capacity at the WwTW and/or there are known planning constraints to additional capacity	Significant existing capacity constraints exist, and require upgrading to accommodate growth	Concerns that there is not sufficient land at low flood risk to accommodate development	Neither inflitration nor attenuation SUDS viable
AMBER	WwTW requires upgrade and there are no known planning issues	Minor upgrades to the sewer system likely to be required to accommodate growth	Flood risk may be a constraint in some parts of the settlements (either within the existing settlement, or on potentially developable land)	Either infiltration or attenuation SUDS viable
GREEN	WwTW has capacity to cater for proposed growth	Sewerage system has capacity to cater for proposed growth. CSO - upstream PE increasing by less than 10% of design PE	Flood risk not considered to be a constraint	Both infiltration and attenuation SUDS viable.

Table 12-1 Criteria for RAG assessment

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Residential Sites						
Land off Coopers Way	SC/005	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.	Located on undulating land (falling to the west) in flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea may be possible.
Sawmills, Caunce Street	SC/015	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer	Located on flat low-level land (<20m AOD) in flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.		with discharge directly to the sea is probably more viable.	No surface water should be discharged into the sewer system. Attenuation to sea or watercourse may be possible. Agreement with EA required on attenuation to watercourse.
Talbot Gateway	SC/016	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.	Located in gently undulating land falling to the west in flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea or watercourse may be possible. Agreement with EA required on attenuation to watercourse.
Land at Seasiders	SC/037	A capital scheme to address supply demand issue has	All planning applications will need to be assessed in detail	Located on flat low-level land (<20m AOD)	Proximity to the sea may result in high groundwater	No development should take place beyond existing

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Way/Unit 1 - 5 Baron Way		recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.	in flood zone 1. Flood risk should not constrain growth.	levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea may be possible.
Former Devonshire Road Hospital	SC/063	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered	Located on flat low-level land (<20m AOD) in flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			to reduce the amount of surface water being discharged into the combined sewer system.			Attenuation to sea may be possible.
Cocker Street Industrial Estate	SC/064	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.	Located on flat low-level land (<20m AOD) in flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea may be possible.
Foxhall Regeneration Site	SC/086	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of	Located on flat low-level land (<20m AOD) in flood zone 1. Land fall slightly to the west. Flood risk should not constrain growth.	Proximity to the sea may result in high groundwater levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		loads should not cause a problem.	surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.		due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea may be possible.
Land off Cornwall Place	SE/025	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system.	Located in gently undulating land in flood zone 1 and 3. Area in flood zone 3 benefits from defences. Sequential approach to site design should be adopted.	Good prospects for infiltration due to permeable superficial geology. Also good prospects for attenuation due to nearby watercourse.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system.
Ryscar Way/ Kincraig	SN/007	A capital scheme to address supply demand issue has	All planning applications will need to be assessed in detail	Located on flat low-level land (<20m AOD)	Both the bedrock and superficial layer are relatively	No development should take place beyond existing

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
Road		recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.	in flood zone 1. Flood risk should not constrain growth.	low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse, or alternatively to the sea.	permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea or watercourse may be possible. Agreement with EA required on attenuation to watercourse.
Ryscar Way/ Kincraig Road (Phase 2)	SN/009	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system.	Located on flat low-level land (<20m AOD) in flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse, or possibly directly to the sea.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
						system. Attenuation to sea or watercourse may be possible. Agreement with EA required on attenuation to watercourse.
Leys Nursery, Leys Road	SN/017	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system.	Located on undulating land (falling to the east) in flood zone 1. Flood risk should not constrain growth.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse, or alternatively to the sea.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea may be possible. Agreement with EA required for attenuation to watercourse.
Blackpool & Fylde College	SN/035	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities.	Located on flat low-level land (<20m AOD) in flood zone 1. Flood risk should not	Good prospects for infiltration in the north of the site due to permeable geology. Superficial Till may	No development should take place beyond existing permitted sites until there has been a wider detailed

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		has increased the capacity. The proposed increase in loads should not cause a problem.	Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.	constrain growth.	prevent infiltration being viable in the south. Good prospects for attenuation due to nearby watercourse. A combination of SUDS will be needed depending on the exact location of development. Geology may constrain infiltration SUDS in the south of the site. Good prospects for attenuation due to nearby watercourse.	assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system.
Marton Moss: Bennets Lane/ Progress Way (M55 Growth Hub)	SS/051	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being	Located in gently undulating land rising to the west in flood zone 1. Main flood risk relates to surface water flooding. Fluvial / tidal flood risk should not constrain growth.	Good prospects for infiltration SUDS in the west of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the east. Reasonable prospects for attenuation due to nearby watercourse.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Agreement with EA required on attenuating runoff to

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			discharged into the combined sewer system.			nearby watercourses.
Marton Moss: Yeadon Way/ Progress Way (M55 Growth Hub)	SS/052	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	There are major network capcity issues in the Fleetwood catchment. It is recommended that with a potential main focus for strategic levels of new development within Blackpool at Marton Moss and on the edge of Blackpool in Fylde as part of the wider M55 Hub, no further development should be permitted beyond existing allocated sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole.	Located in gently undulating land in flood zone 1. Main flood risk relates to surface water flooding. Fluvial / tidal flood risk should not constrain growth.	Infiltration SUDS less likely due to geology. Good prospects for attenuation due to nearby watercourse.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.
Marton Moss: Progress Way	SS/053	A capital scheme to address supply demand issue has	There are major network capcity issues in the	Located in gently undulating land rising to	Good prospects for infiltration in the west and	No development should take place beyond existing

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
to School Road (M55 Growth Hub)		recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	Fleetwood catchment. It is recommended that with a potential main focus for strategic levels of new development within Blackpool at Marton Moss and on the edge of Blackpool in Fylde as part of the wider M55 Hub, no further development should be permitted beyond existing allocated sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole.	the east in flood zone 1. Main flood risk relates to surface water flooding. Fluvial / tidal flood risk should not constrain growth.	south east of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the north east. Good prospects for attenuation due to nearby watercourse.	permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Agreement with EA required on attenuating runoff to nearby watercourses.
South Beach Regeneration Site (569-589/600-613 New South Promenade)	SS/054	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new	Located on flat low-level land (<20m AOD) in flood zone 1. Flood risk should not constrain growth.	Proximity to the sea may result in high groundwater levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult due to distance involved (but	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
		problem.	developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.		there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea or watercourse may be possible.
Leisure and Mixed Use Land						
Whyndyke Farm (M55 Growth Hub)	CSM1	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	There are major network capcity issues in the Fleetwood catchment. It is recommended that with a potential main focus for strategic levels of new development within Blackpool at Marton Moss and on the edge of Blackpool in Fylde as part of the wider M55 Hub, no further development should be permitted beyond existing allocated sites until there has been a wider detailed assessment of strategic	Located on steep land in flood zones 1 and 2. Land falls steeply to the east.	Both the bedrock and superficial layer are relatively low permeability making infiltration less likely. However there is a possibility that a small part of the north of the site overlies the more permeable Alluvium. Good prospects for attenuation due to nearby watercourse.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Agreement with EA required on attenuation to watercourse.

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
			drainage and network capacity issues to meet proposed developments for the area as a whole.			
Former Central Station/ Promenade Strategic Town Centre Site	CSR10	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity. The proposed increase in loads should not cause a problem.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.	Located on flat low-level land (<20m AOD) in flood zone 1. Flood risk should not constrain growth.	Proximity to the sea may result in high groundwater levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea may be possible.
Rigby Road Site (developed in place of the Blackpool	CSR13	A capital scheme to address supply demand issue has recently been completed at Fleetwood WwTW which has increased the capacity.	All planning applications will need to be assessed in detail in isolation, in consultation with United Utilities. Policies should be considered	Located in gently undulating land falling to the west in flood zone 1. Flood risk should not constrain	Proximity to the sea may result in high groundwater levels which prevent infiltration being feasible.	No development should take place beyond existing permitted sites until there has been a wider detailed assessment of strategic

Settlement	Reference Number	WwTW infrastructure capacity	Wastewater network infrastructure capacity	Flood risk	Surface water management	Overall assessment
and Fylde College site which will remain education).		The proposed increase in loads should not cause a problem.	to prevent the discharge of surface water from new developments into the existing combined sewer system. Where redevelopment is occurring, policies should be considered to reduce the amount of surface water being discharged into the combined sewer system.	growth.	Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.	drainage and network capacity issues to meet proposed developments for the area as a whole. No surface water should be discharged into the sewer system. Attenuation to sea may be possible.

Table 12-2 Summary of WCS findingsfor development sites in Blackpool Borough

12.4 Conclusions and Recommendations for Blackpool Borough

In Blackpool, the RSS requirement is to build an additional 8000 new homes. The WCS has identified potential environmental and infrastructure capacity constraints to development in the Borough and has sought to identify the preferred locations for development from a water cycle perspective.

In this section we have provided recommendations based on the findings of the WCS, and recommendations for further work. Further work can be addressed through a detailed WCS, or alternatively can be carried out as discrete packages of work, as required.

12.4.1 Water resources

There is a predicted supply-demand surplus within the study area until 2022/23, however the local planning authorities should implement planning policies to ensure the efficient use of water in both the new and existing housing and commercial stock (e.g. CSH level 3 and BREEAM excellent standards). The Blackpool Core Strategy Preferred Option, November 2010 recognises that "Sustainable natural resource management within Blackpool means ensuring greater efficiency in our use of natural resources,". However this is stated in relation to Policy S7 "Climate Change and Sustainable Development" and Policy M5 "Neighbourhood Character, Marton Moss/ M5 hub" which do then not specifically make reference to water efficiency measures. It is debatable whether this fulfils the duty to promote water efficiency and it is therefore recommended that in the short-term policies are updated to include specific mention of the promotion of water efficiency. It is not necessary to restrict new development to achieving certain levels of CSH at the present time but policy makers should again be mindful of the Government's Building a Greener Future Policy and potential changes to the Building Regulations which may require policy to be updated and strengthen in the medium to long term.

UU's current policy on metering includes metering of all new households and non-household properties. In addition to new development, demand must be reduced in the existing housing stock. The local planning authorities, in partnership with the Environment Agency and UU, should continue to encourage the uptake of metering in the existing housing stock, and should encourage more sustainable use of water resources through education programmes, for example.

12.4.2 Flood risk management

Developers need to follow the principles and requirements of national policy, most notably PPS25: Development and Flood Risk. Any new development should be located in the areas of lowest flood risk and must not increase risk to existing development and areas identified as functional floodplain should be protected from development. Where parts of development sites are proposed within Flood Zones 2 and 3, developers should undertake a site-specific Flood Risk Assessment (FRA) to establish the extent of Flood Zones 2, 3a and 3b, and the future risk of climate change. Further modelling may be required to establish these risk areas. Land use within these sectors should be allocated according to the appropriate use as outlined in PPS25.

For a number of locations, instances of surface water flooding from artificial drainage and surface water have also been identified as a problem, particularly at times of heavy and prolonged rainfall. It is therefore recommended that appropriate surface water management policies should be developed to ensure that flood risk is not increased within the site or to locations downstream.

It must be ensured that all new development is 'safe,' meaning that dry pedestrian access to and from the development is possible without passing through the 1 in 100 year plus climate change floodplain, and emergency vehicular access is possible.

It may be possible to cluster potential development areas together to consider strategic flood risk management activities that would provide a strategic benefit and bring benefit to the wider community.

In Blackpool Borough there are flood risk issues which need to be considered when development proposals come forward. The recommendations include:

- There are surface water and sewer flooding issues in Anchorsholme and Marton Moss due to reliance on and inundation of the public sewerage system. New development must properly account for surface water runoff to ensure that surface water runoff from new developments (especially on greenfield land) does not increase the risk of surface water flooding in these areas.

12.4.3 Surface water management
The following recommendations are made in light of the findings of the outline WCS:

- As a minimum runoff rates and volumes from the development site should not be greater than runoff rates and volumes prior to development up to the 100 year 6 hour rainfall event (plus an allowance for climate change). In brownfield development sites a reduction of runoff rates and volumes should be achieved compared to the existing rates and volumes. The runoff requirements for a development site should be agreed with the Environment Agency at an early stage in the planning process.

- In accordance with PPS25, and the forthcoming Floods and Water Management Bill (and associated national SUDS standards) SUDS are required to be implemented at all scales of development At the household level there should be a presumption away from connecting property extensions or additional hard-standing area to the sewerage network. The additional runoff should be managed at source, where possible, or connected to a watercourse (in agreement with the Environment Agency).

- Infiltration SUDS should be promoted where it is practical. Where infiltration SUDS are not applicable surface water should be discharged to a watercourse (in agreement with the Environment Agency) at a rate no greater than greenfield.

- Where infiltration SUDS are proposed, this must be supported by a groundwater risk assessment, carried out by the developer, to ensure groundwater is not polluted. Groundwater flooding should also be considered where infiltration SUDS are proposed.

- Surface water should not be connected to the sewerage network.

In addition to the recommendations above, the assessment indicates that a combination of infiltration and attenuation based SUDS approaches are likely to be suitable across the Borough. However, the nature of the underlying geology indicates that attenuation SUDS are likely to be most suitable.

In accordance with the Floods and Water Management Act, there should be a preference towards infiltration based SUDS approaches where they are deemed feasible. It is developers' responsibility to assess the suitability of SUDS approaches as part of their drainage planning for development.

12.4.4 Wastewater infrastructure

The following wastewater recommendations based on the findings of the outline WCS:

- Fleetwood Marsh WwTW does have hydraulic capacity; however the network is severely constrained.

- There are major network capacity issues in the Fleetwood Marsh catchment. It is recommended that with a potential main focus for strategic levels of new development within Blackpool at Marton Moss and on the edge of Blackpool in Fylde as part of the wider M55 Hub, **no further development should be permitted beyond existing allocated sites** until there has been a wider detailed assessment of strategic drainage and network capacity issues to meet proposed developments for the area as a whole.

- Surface water should be kept out of the sewerage network. The removal of the automatic right to connect in the Floods and Water Management Act, will help sewerage undertakers reduce surface water connections to the sewerage network. It is recognised that in some locations there will be no practicable alternative other than connecting surface water to the sewerage network, but it is the responsibility of the developer to demonstrate that all other possible drainage alternatives have been explored in the first instance.

- Foul flows from new developments can be reduced through implementation of water efficiency measures and metering of all new development. This will reduce the new net burden on the wastewater network and at the WwTW.

12.4.5 Water quality

The following water quality recommendations based on the findings of the outline WCS:

- In general WwTW which discharge to watercourses with a higher dilutive capacity should be considered preferable for growth, because the WwTW will have a lower impact on the watercourse.

- Growth must not cause deterioration of water quality and should not hinder the ability of a water body to meet the WFD.

- Early discussions should take place between the Environment Agency, the local planning authority and UU to confirm the new consents needed to serve growth.

- The study has identified WwTW catchments where there are concerns that development may cause capacity issues either at the WwTW or throughout the network. Further assessments of sustainable drainage strategies will be required in these locations. It is critical that early consultation between the local planning authority and the sewerage undertaker occurs, to ensure timely and adequate provision of wastewater infrastructure and to avoid any deterioration of water quality.

- In general WwTW which discharge to watercourses with a higher dilutive capacity should be considered preferable for growth, because the WwTW will have a lower impact on the watercourse.

- If actual development differs from the proposed development used for this WCS, Blackpool Borough Council should consult with the Environment Agency to identify whether a WwTW will require a new consent to support growth, and if so the nature of the consent.

Appendix A. Figures

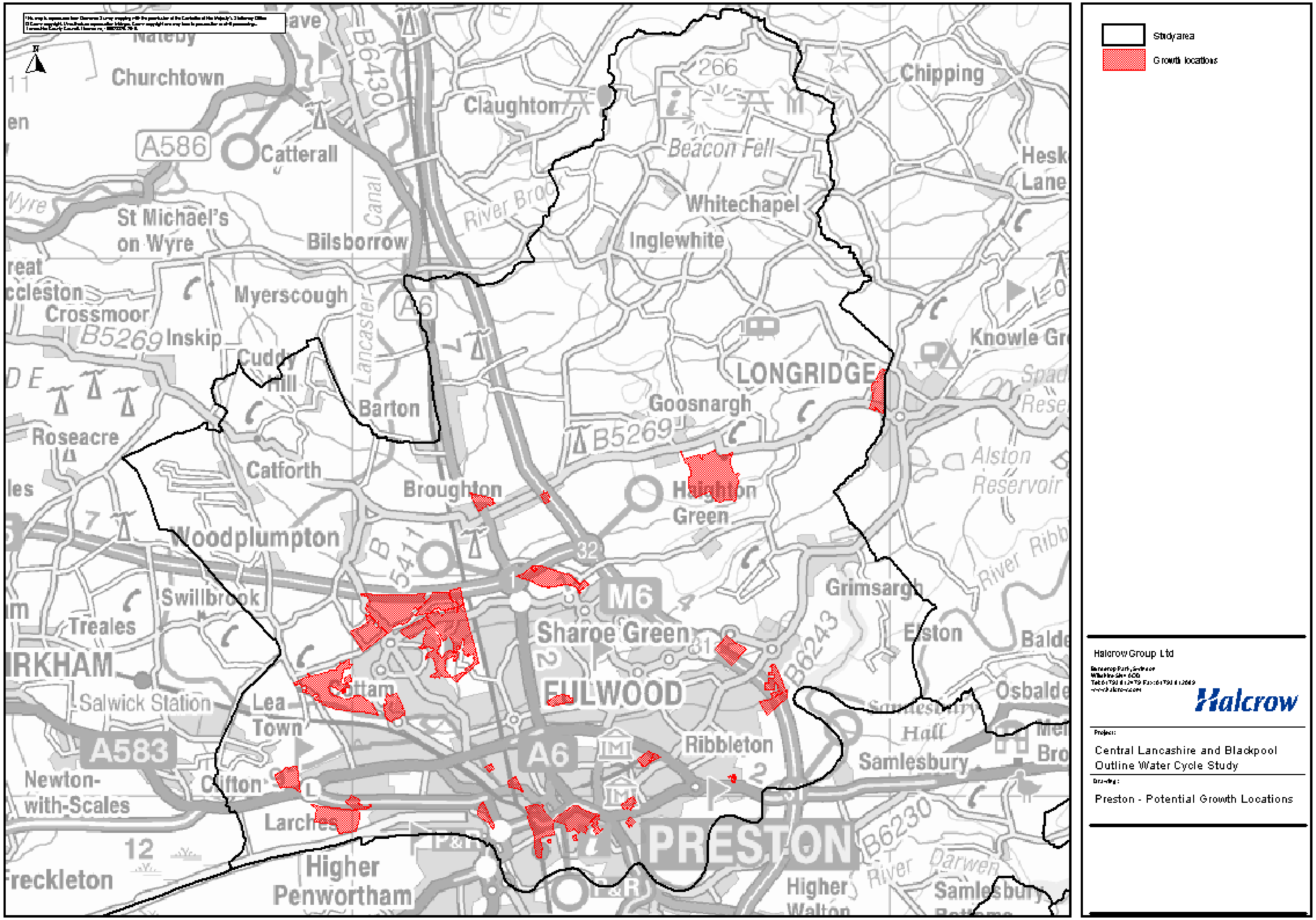

Figure 2-1: Potential Growth Locations in Preston City Council

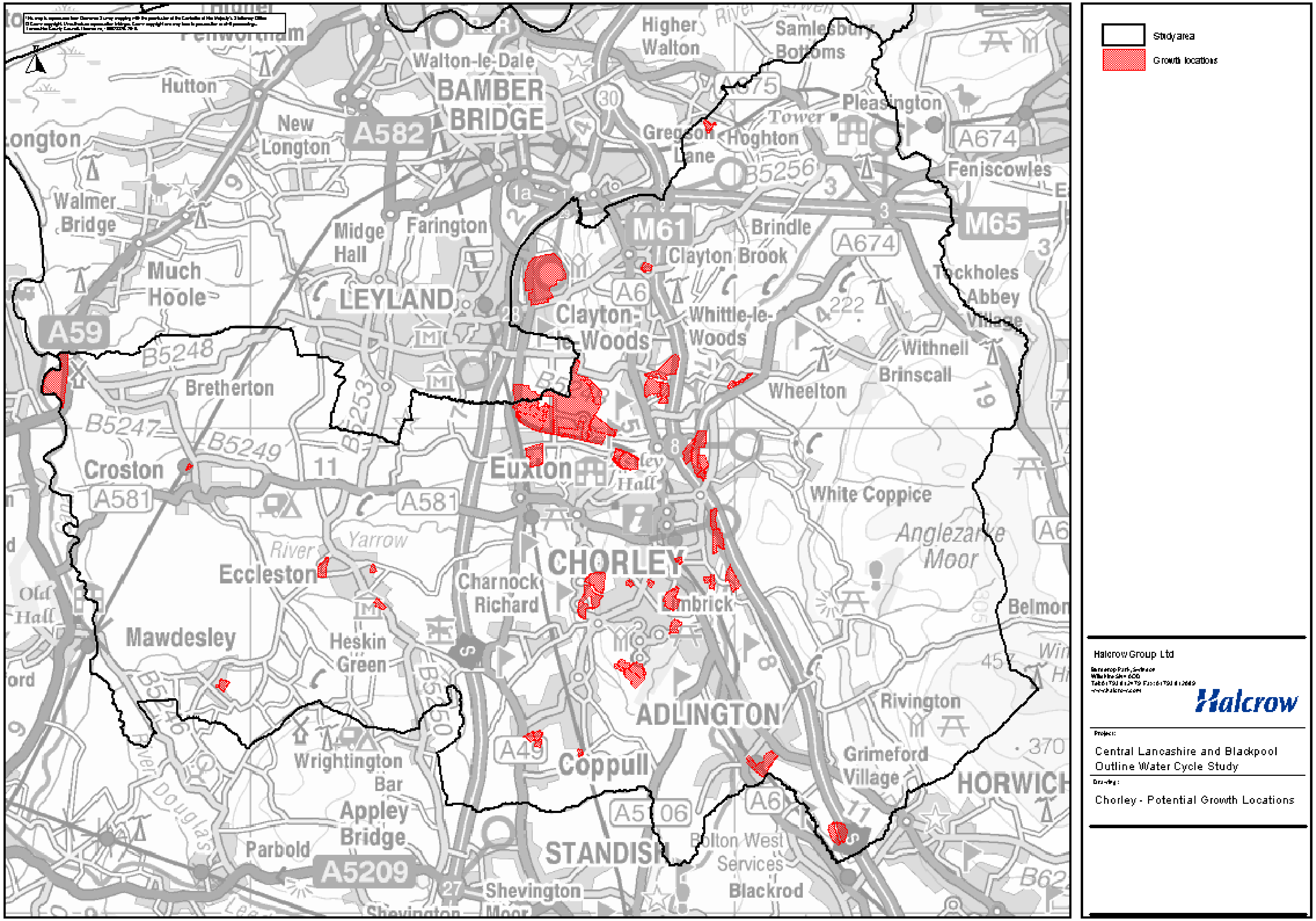

Figure 2-2: Potential Growth Locations in Chorley Borough Council

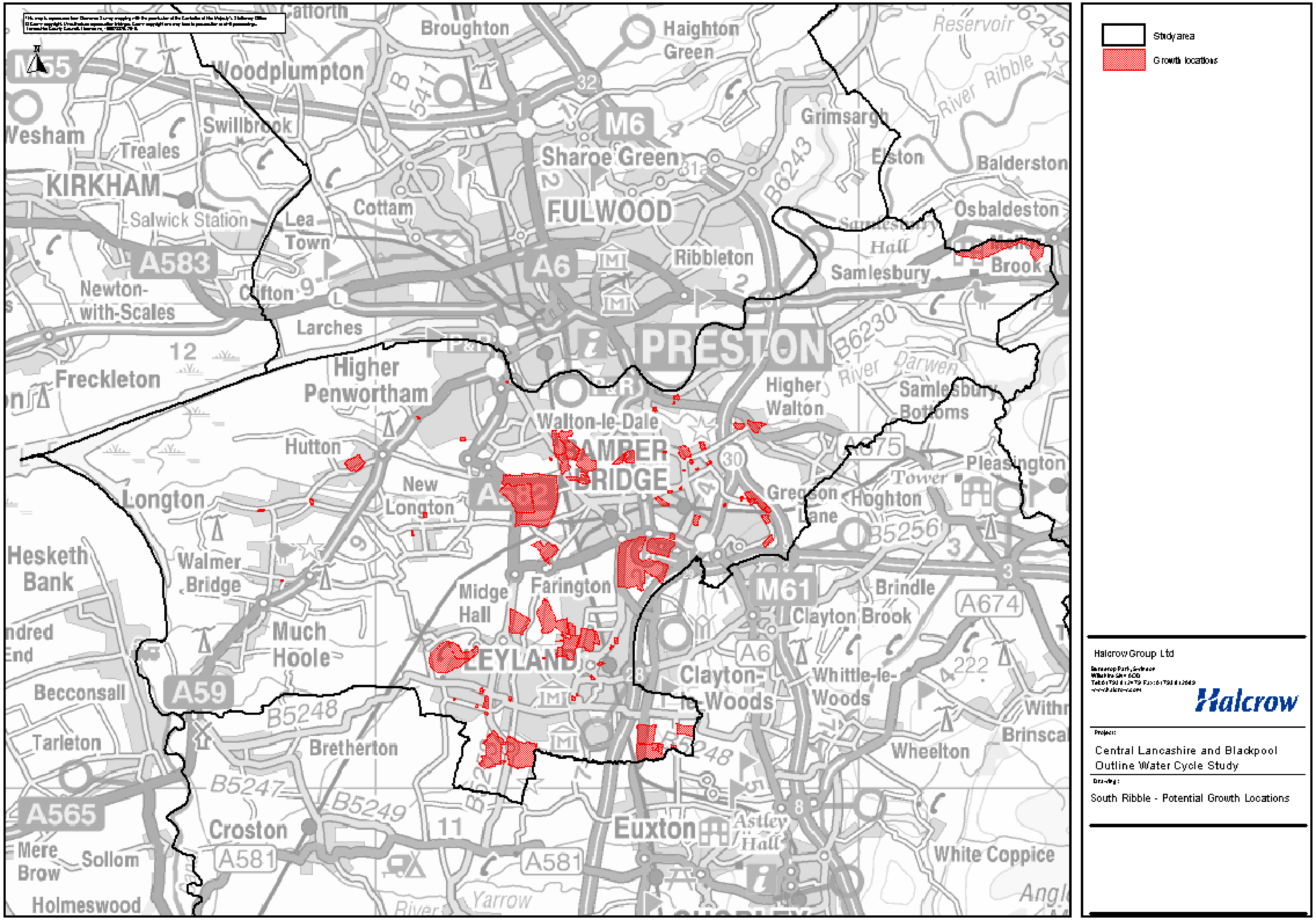

Figure 2-3: Potential Growth Locations in South Ribble Borough Council

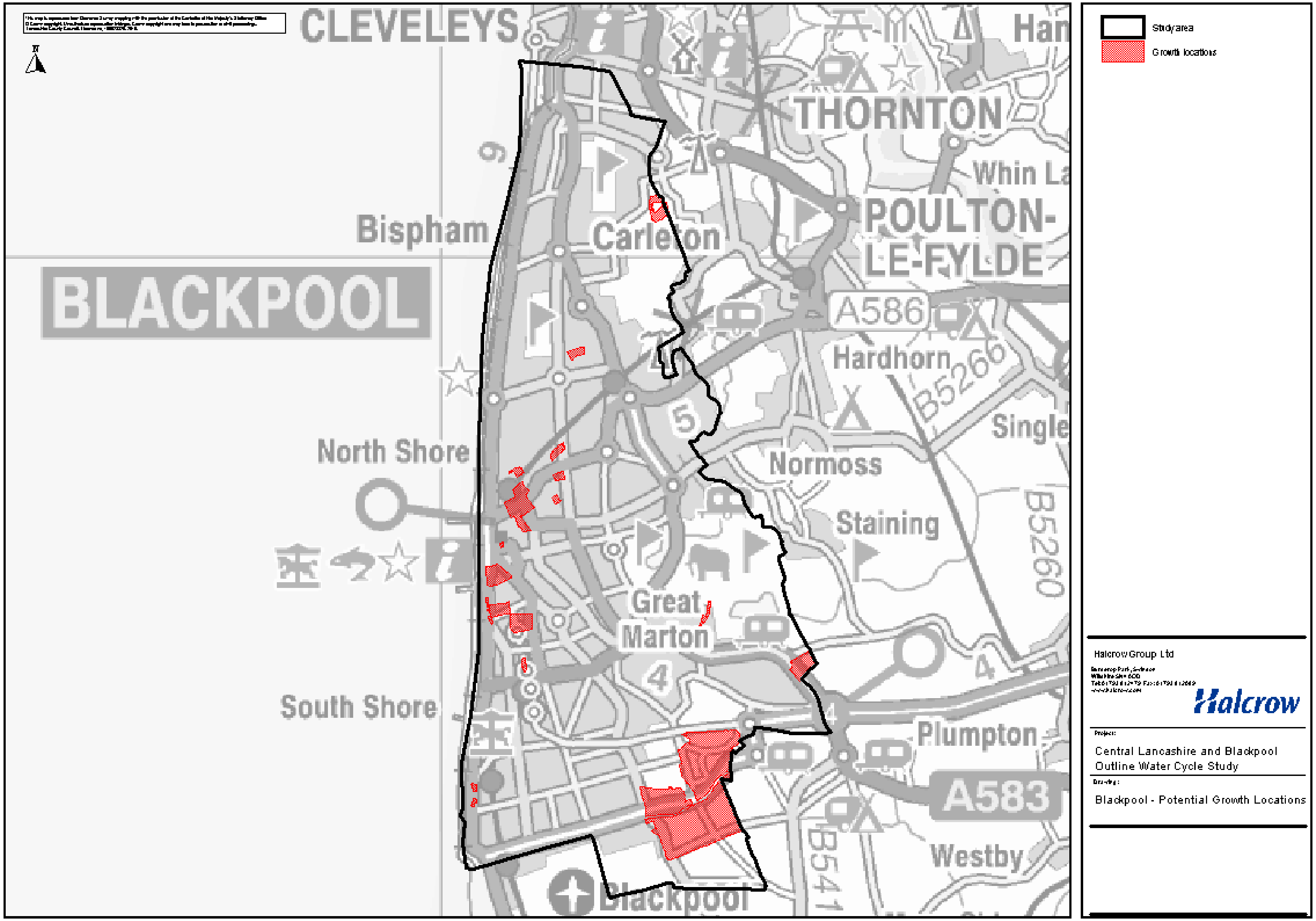

Figure 2-4: Potential Growth Locations in Blackpool Borough Council

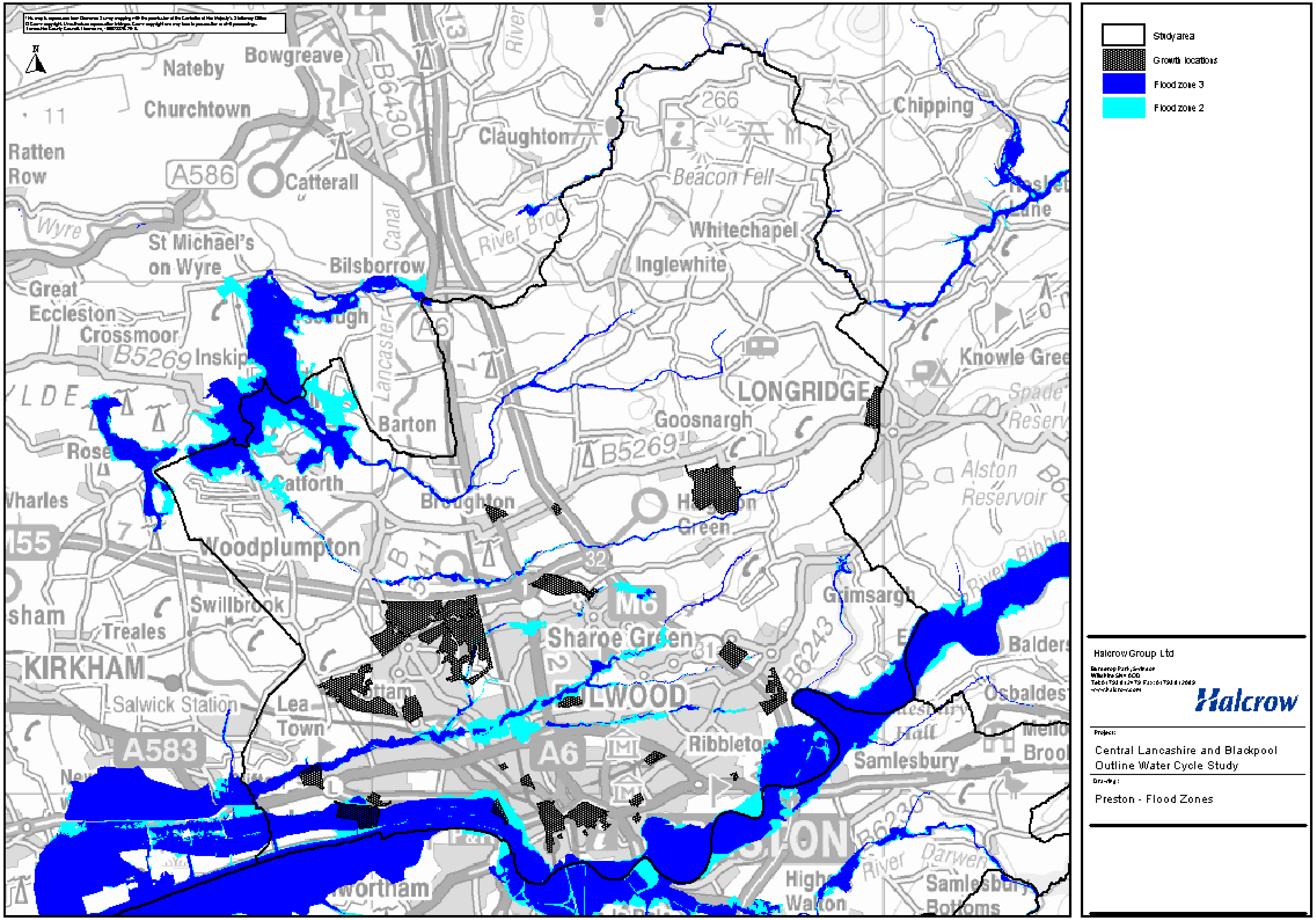

Figure 4-1: Environment Agency Flood Zones locations in Preston City Council

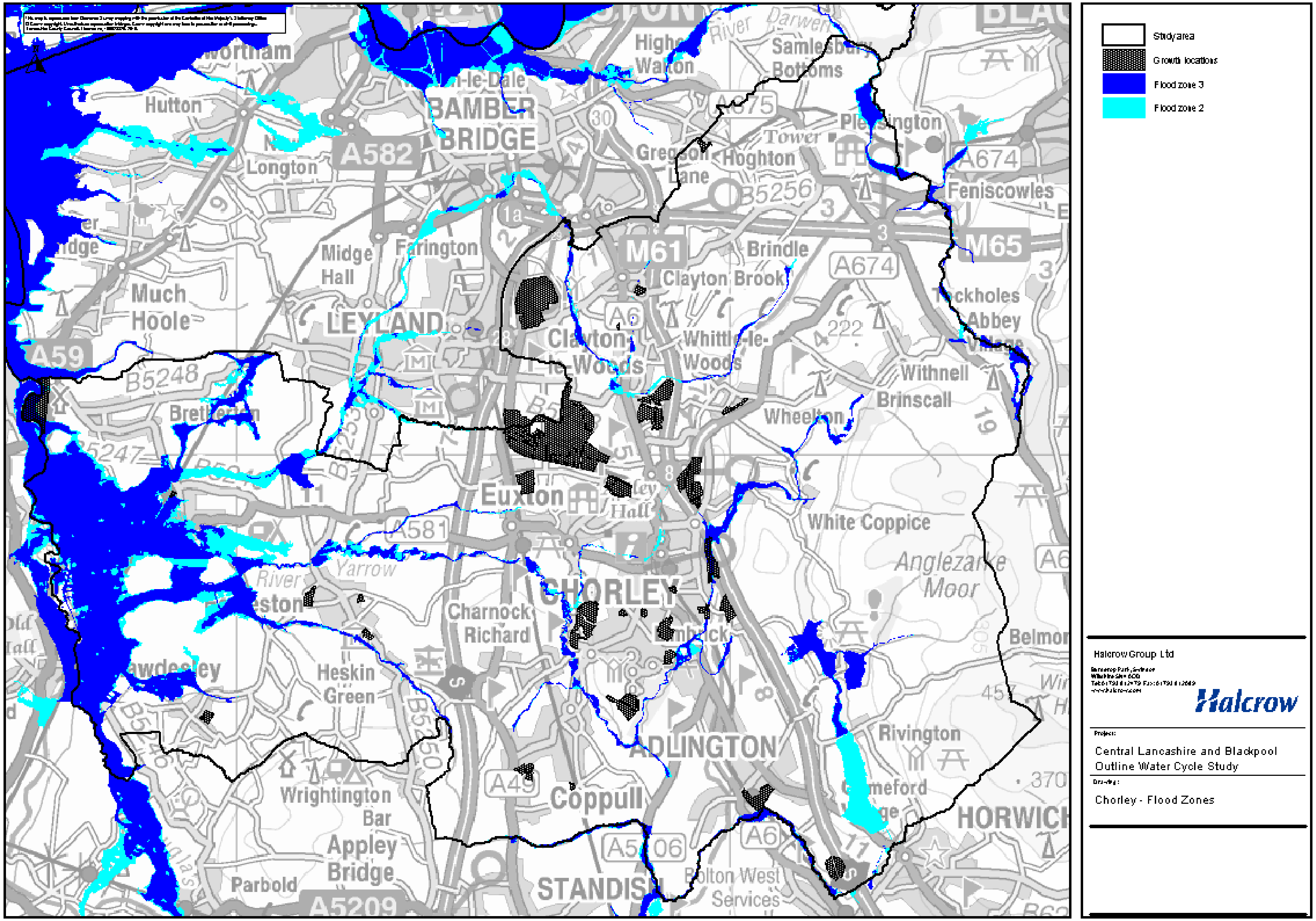

Figure 4-2: Environment Agency Flood Zones locations in Chorley Borough Council

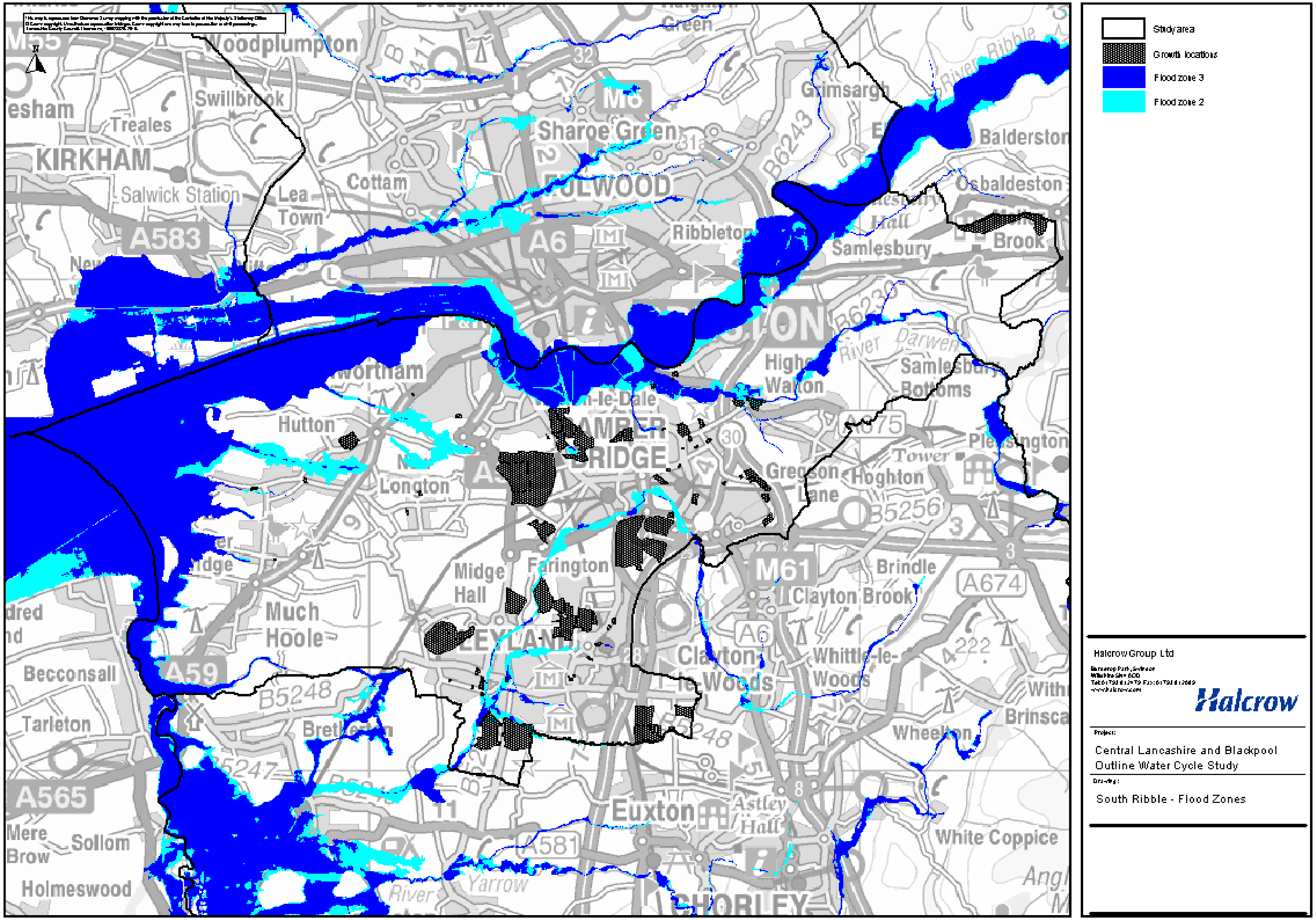

Figure 4-3: Environment Agency Flood Zones locations in South Ribble Borough Council

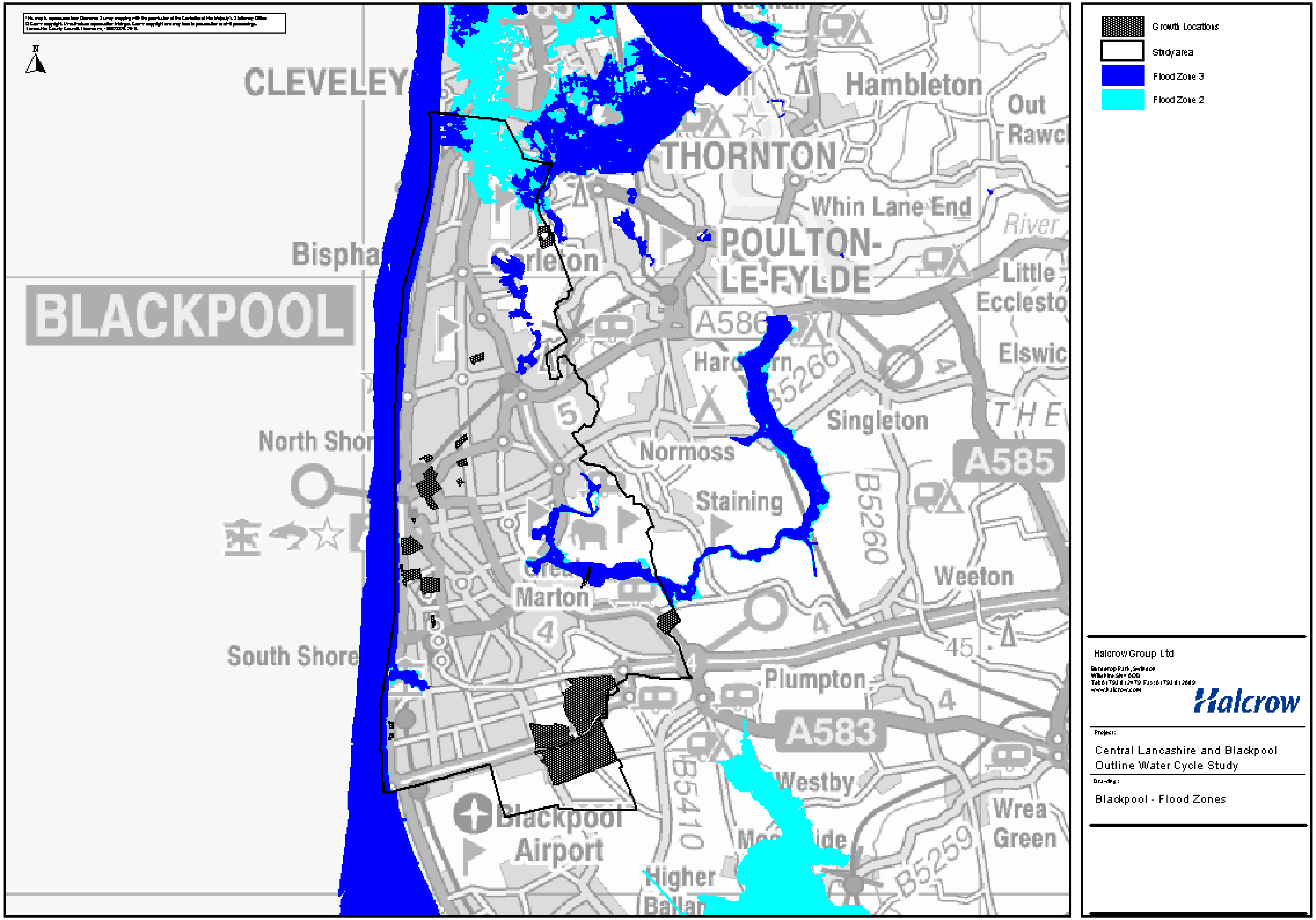

Figure 4-4: Environment Agency Flood Zones locations in Blackpool Borough Council

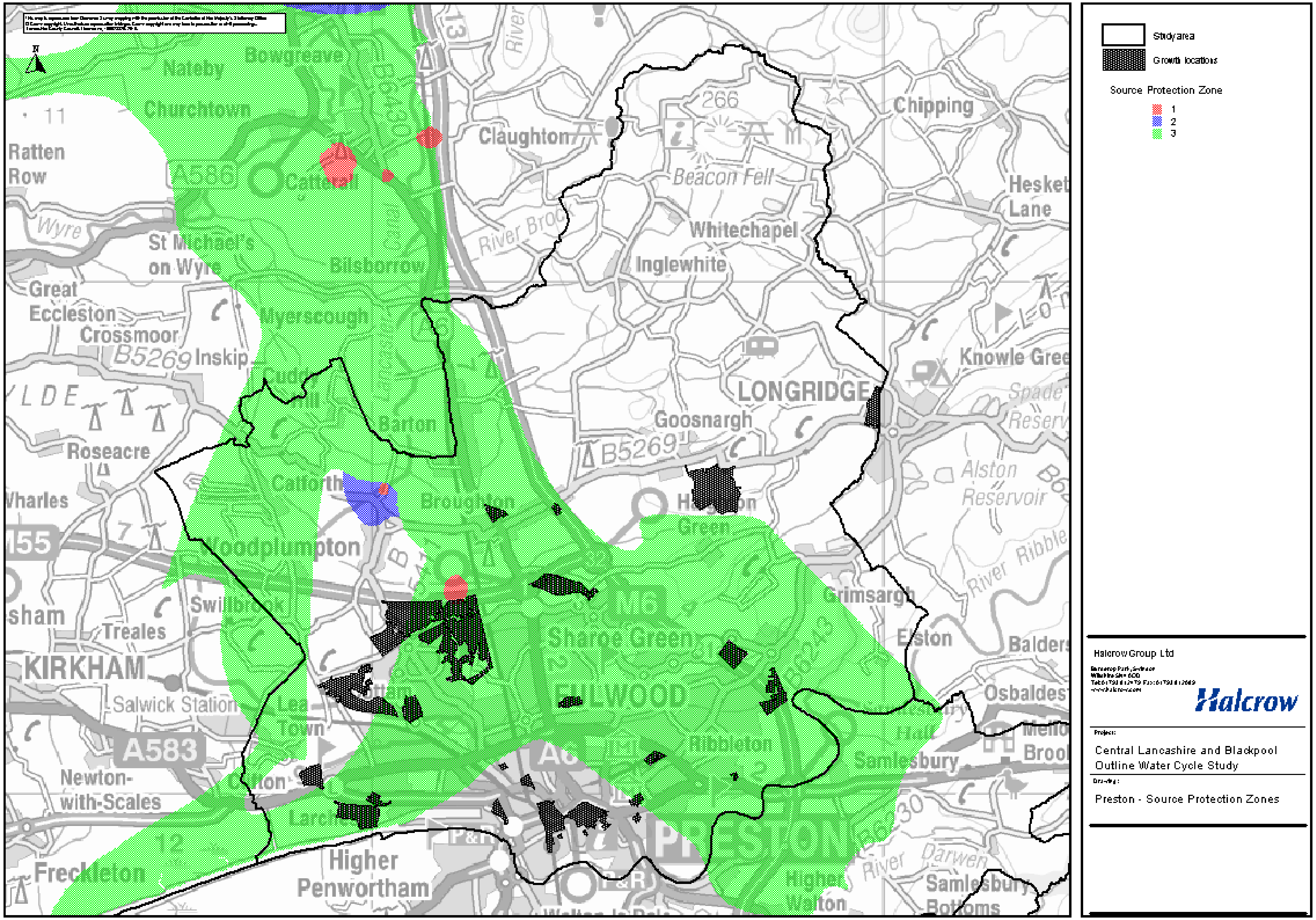

Figure 5-1: Source Protection Zones locations in Preston City Council

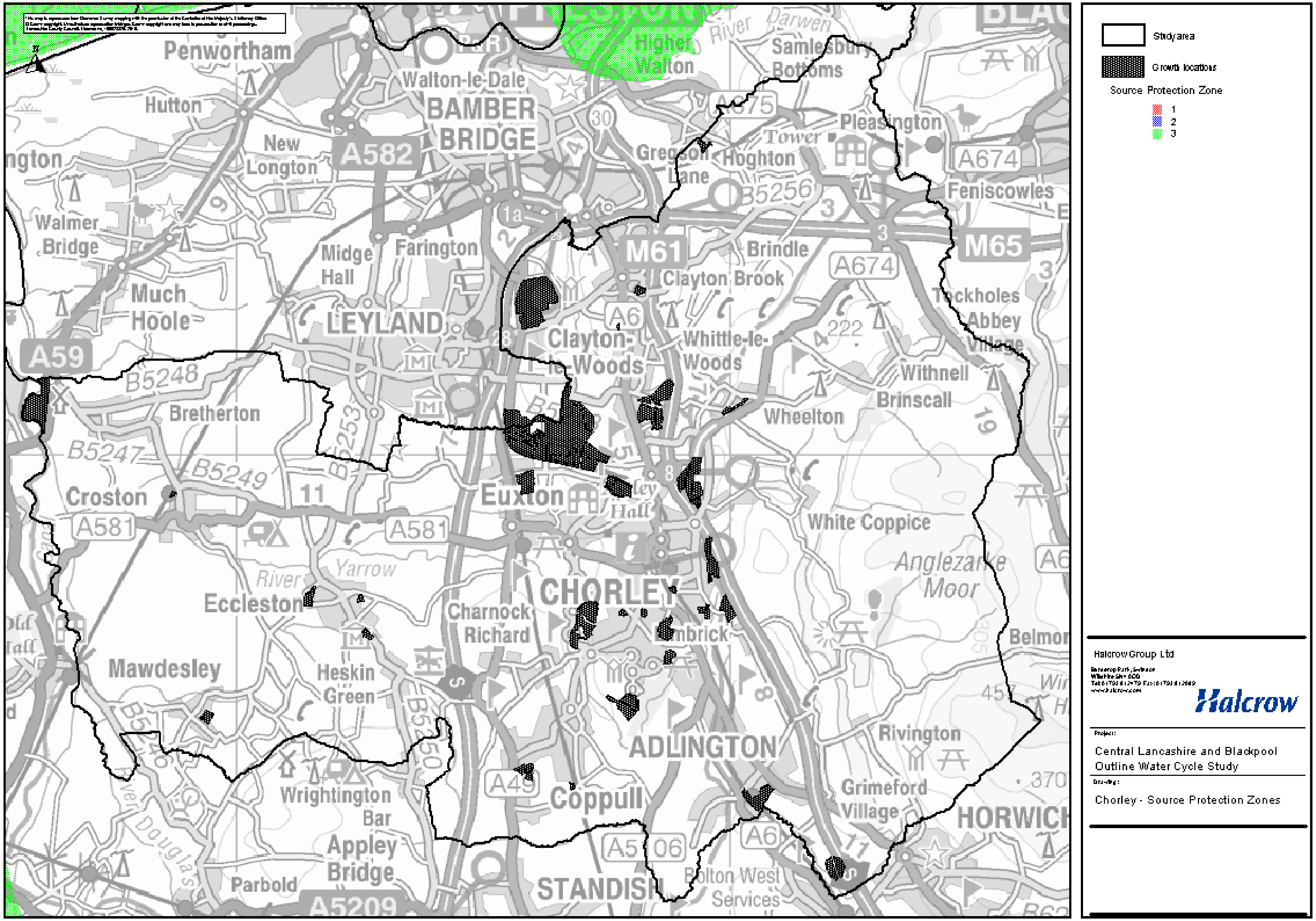

Figure 5-2: Source Protection Zones locations in Chorley Borough Council

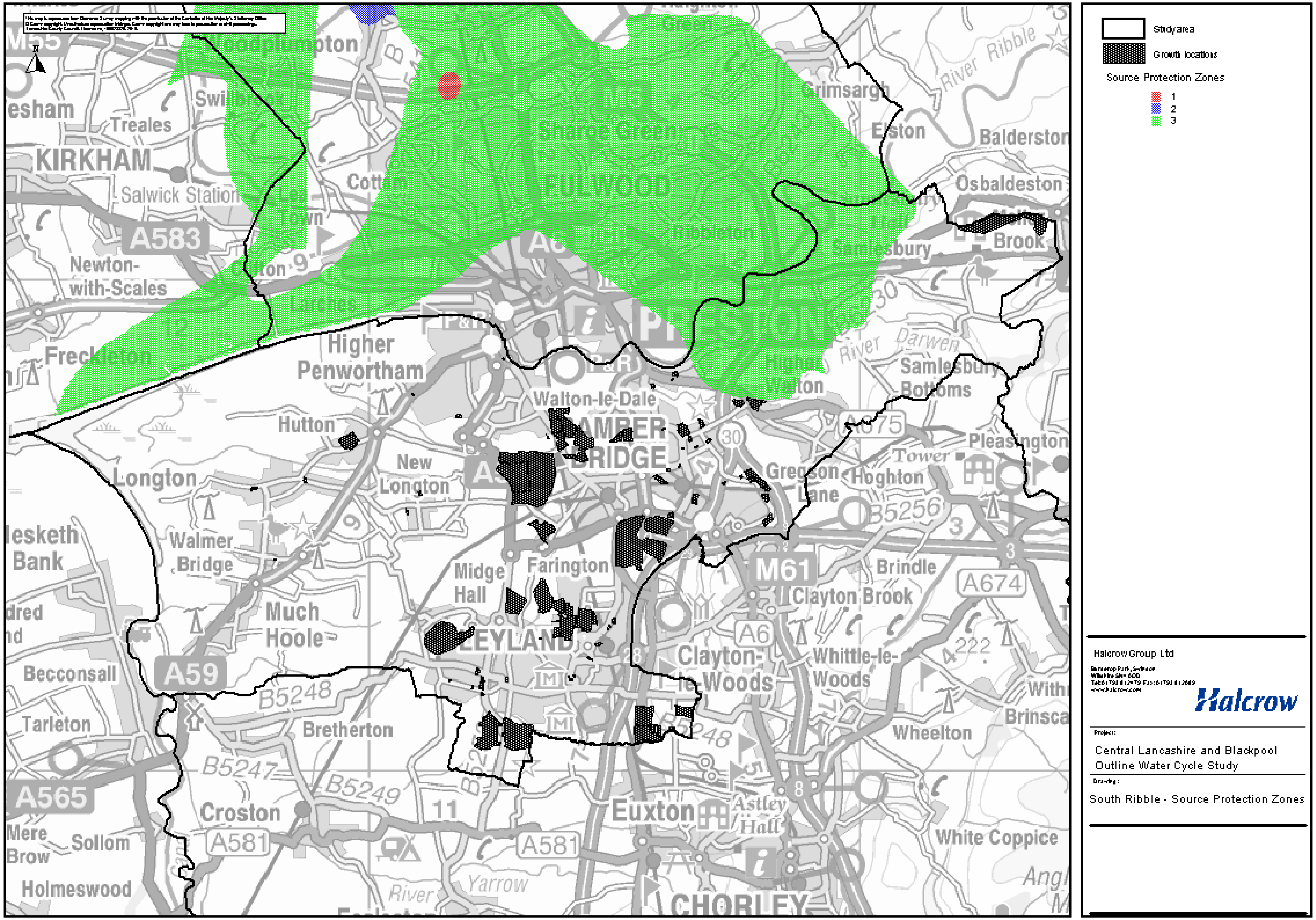

Figure 5-3: Source Protection Zones locations in South Ribble Borough Council

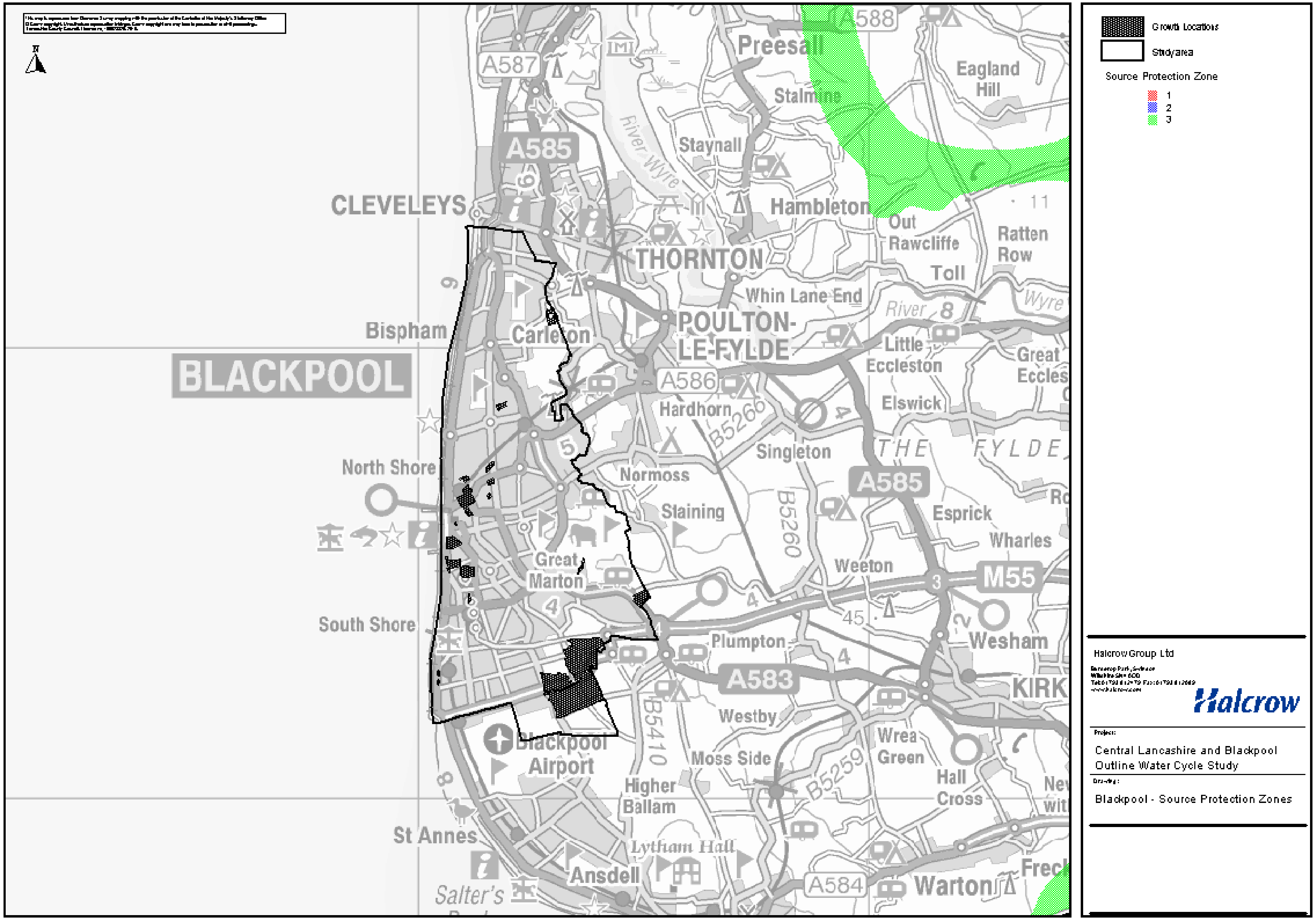

Figure 5-4: Source Protection Zones locations in Blackpool Borough Council

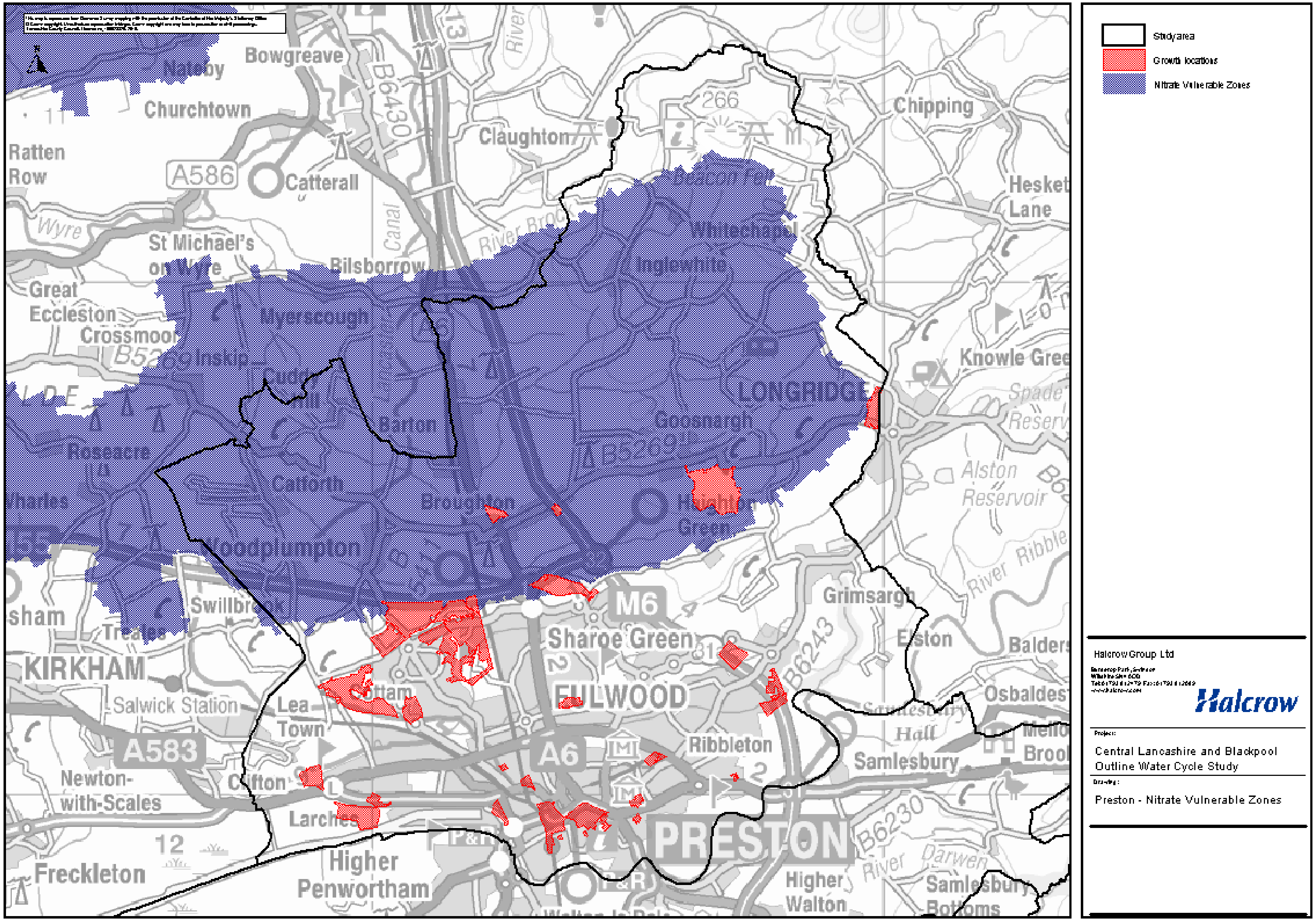

Figure 5-5: Nitrate Vulnerable Zones locations in Preston City Council

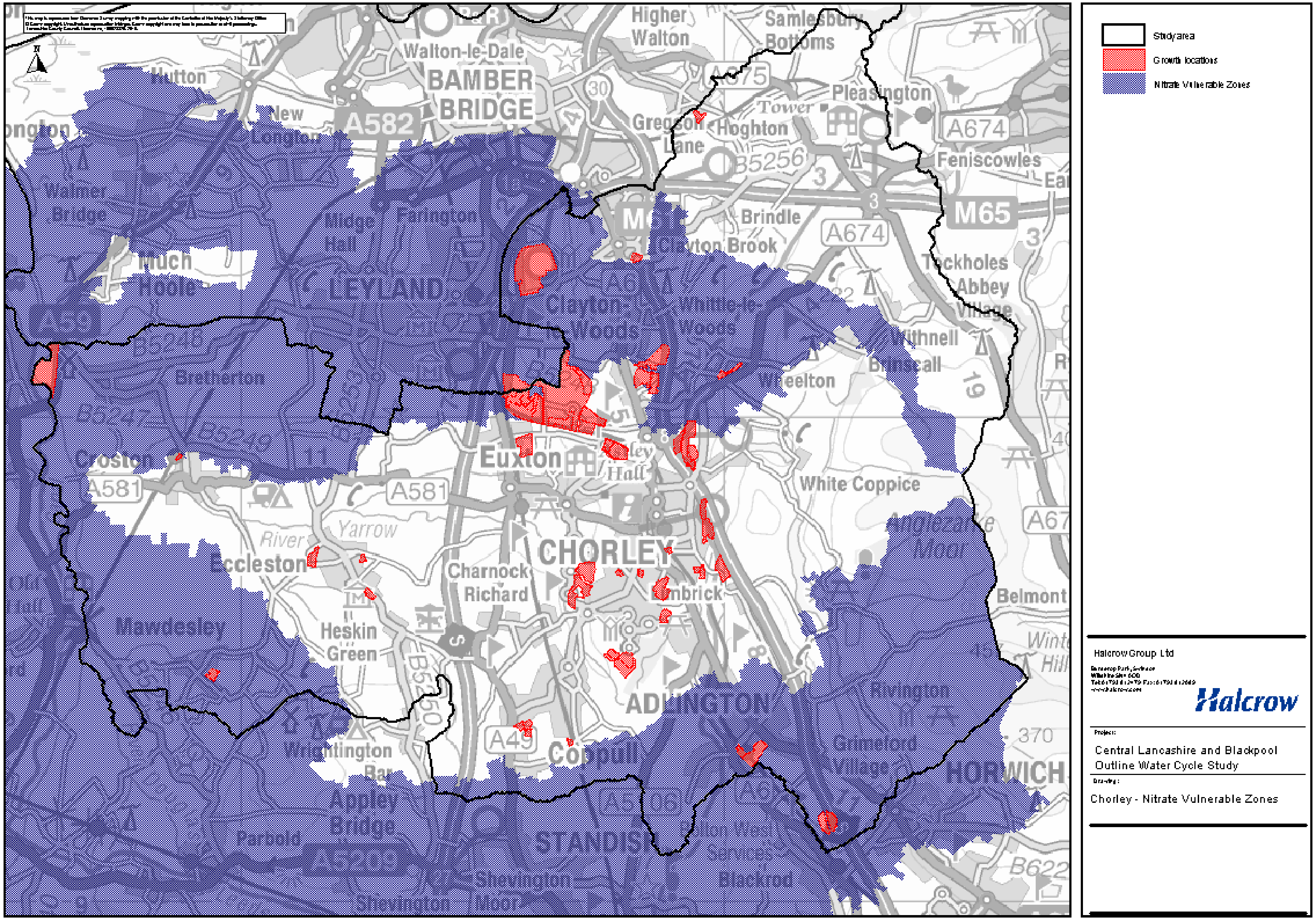

Figure 5-6: Nitrate Vulnerable Zones locations in Chorley Borough Council

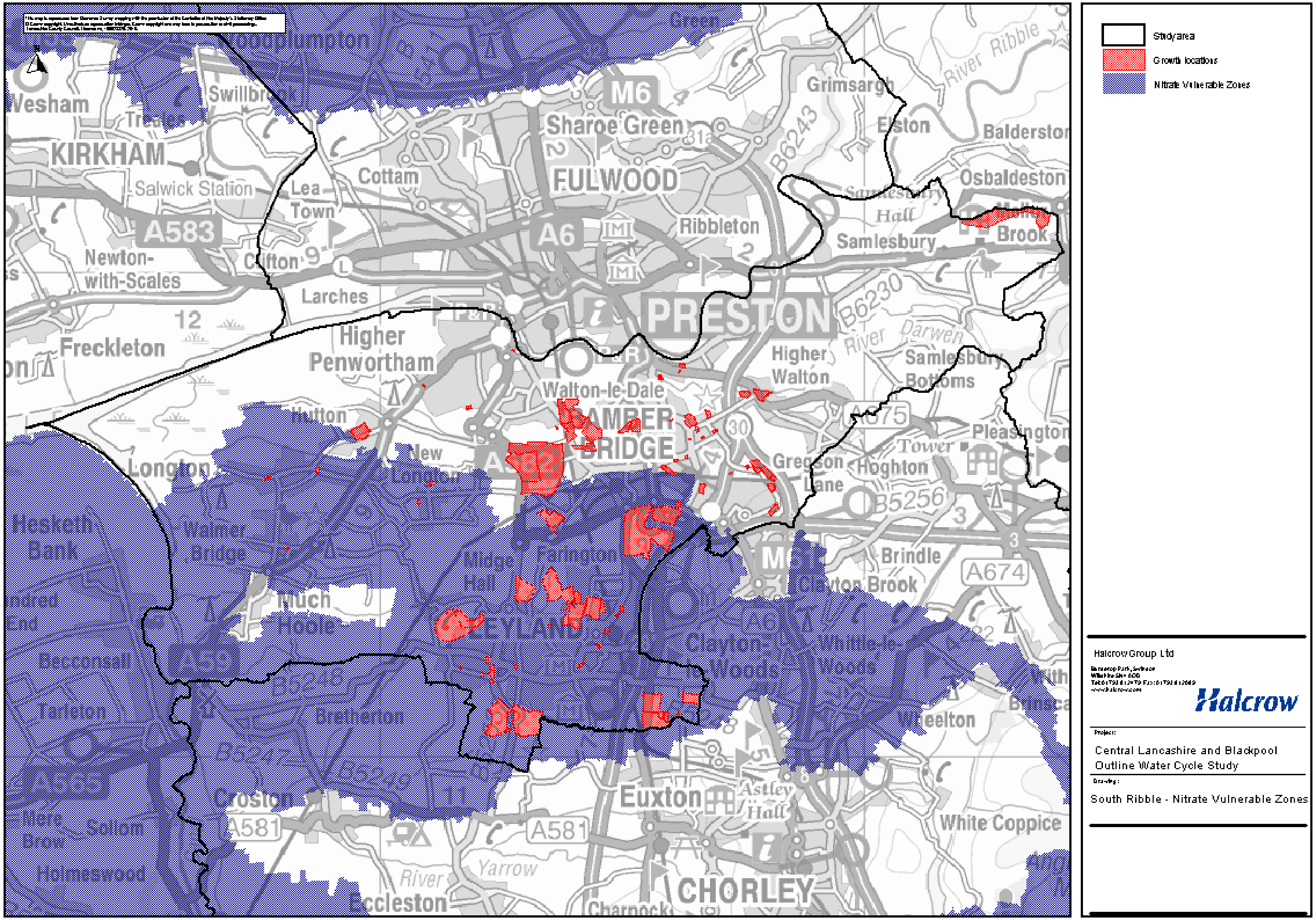

Figure 5-7: Nitrate Vulnerable Zones locations in South Ribble Borough Council

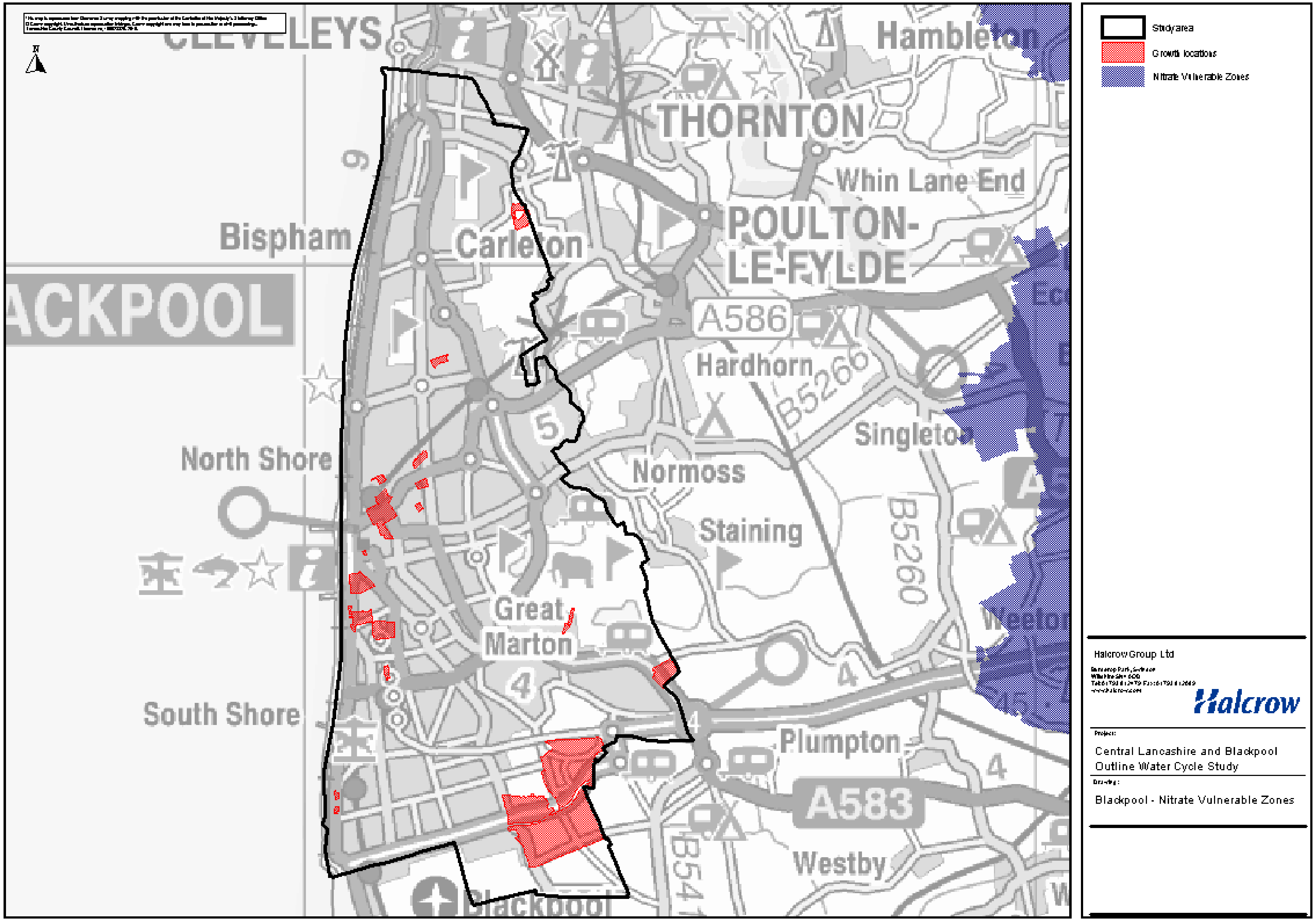

Figure 5-8: Nitrate Vulnerable Zones locations in Blackpool Borough Council

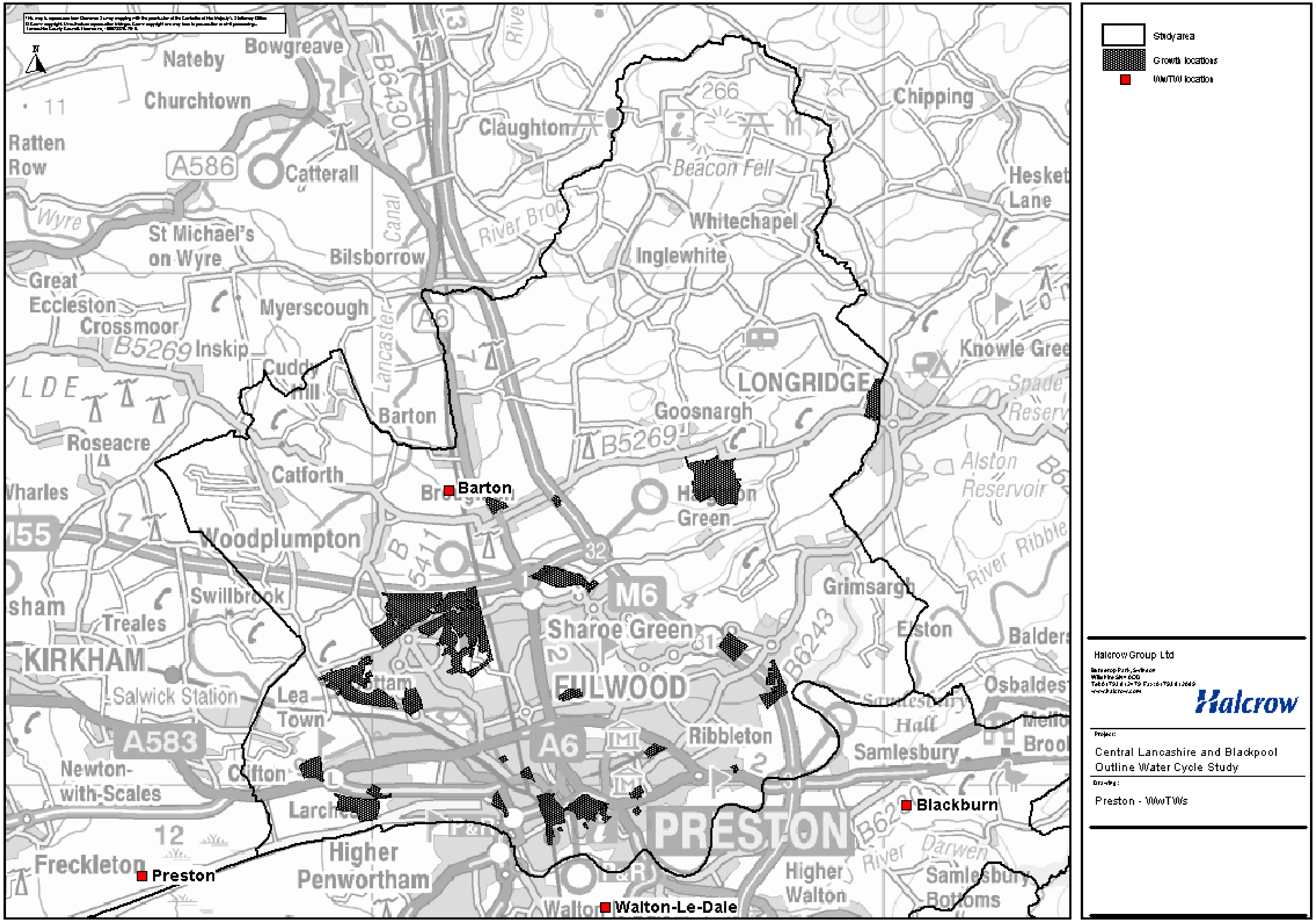

Figure 7-1: Wastewater Treatment Works locations in Preston City Council

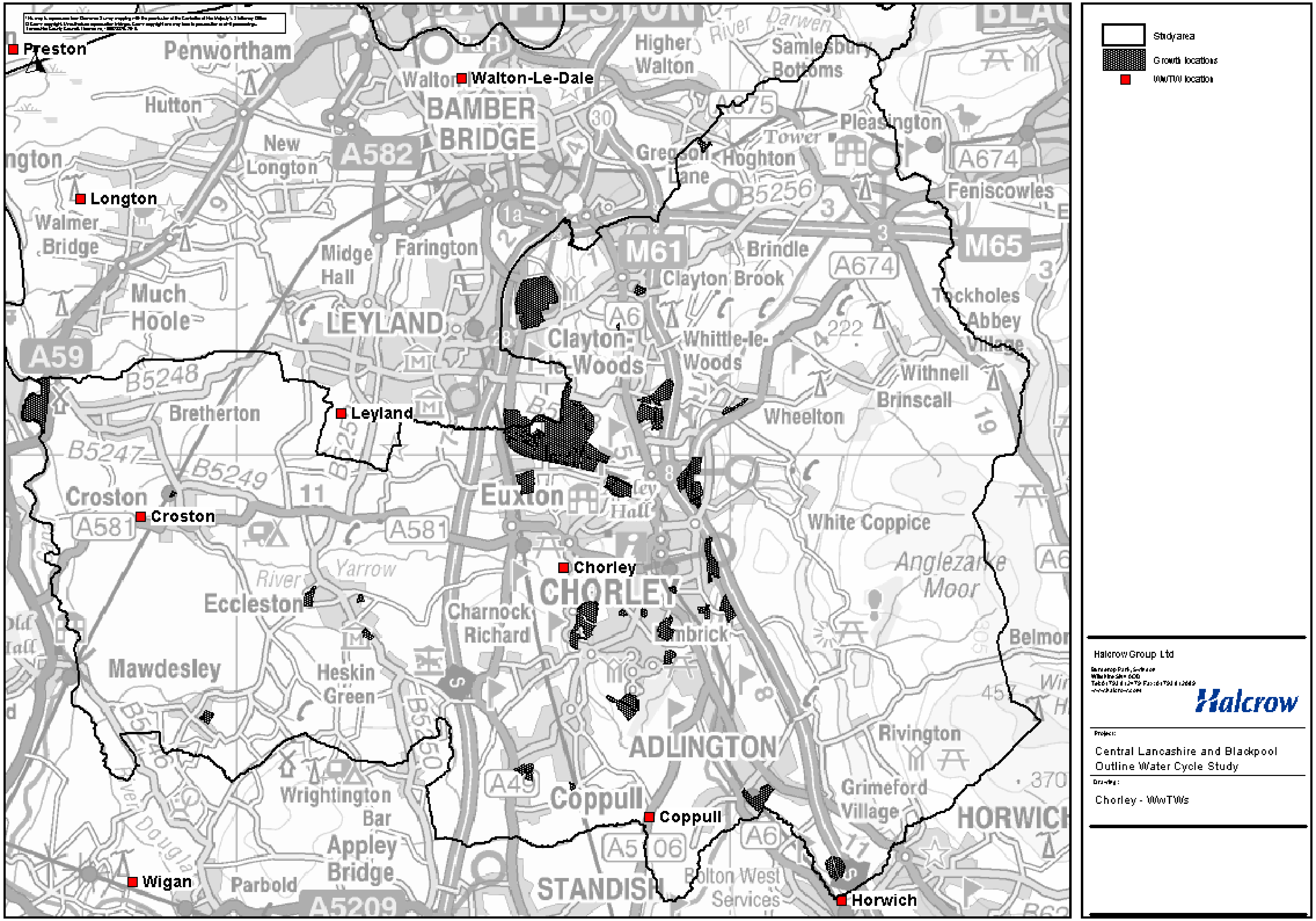

Figure 7-2: Wastewater Treatment Works locations in Chorley Borough Council

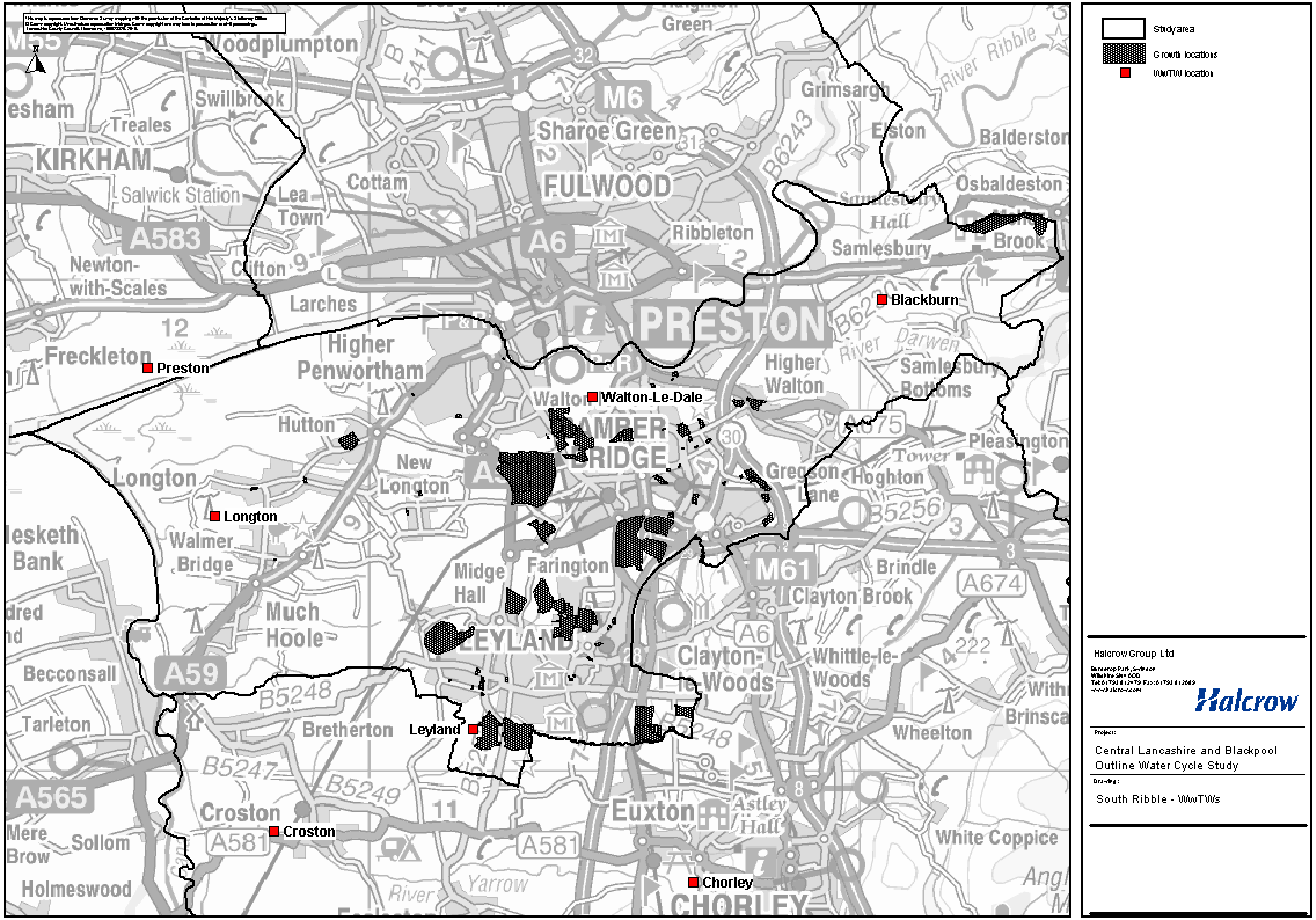

Figure 7-3: Wastewater Treatment Works locations in South Ribble Borough Council

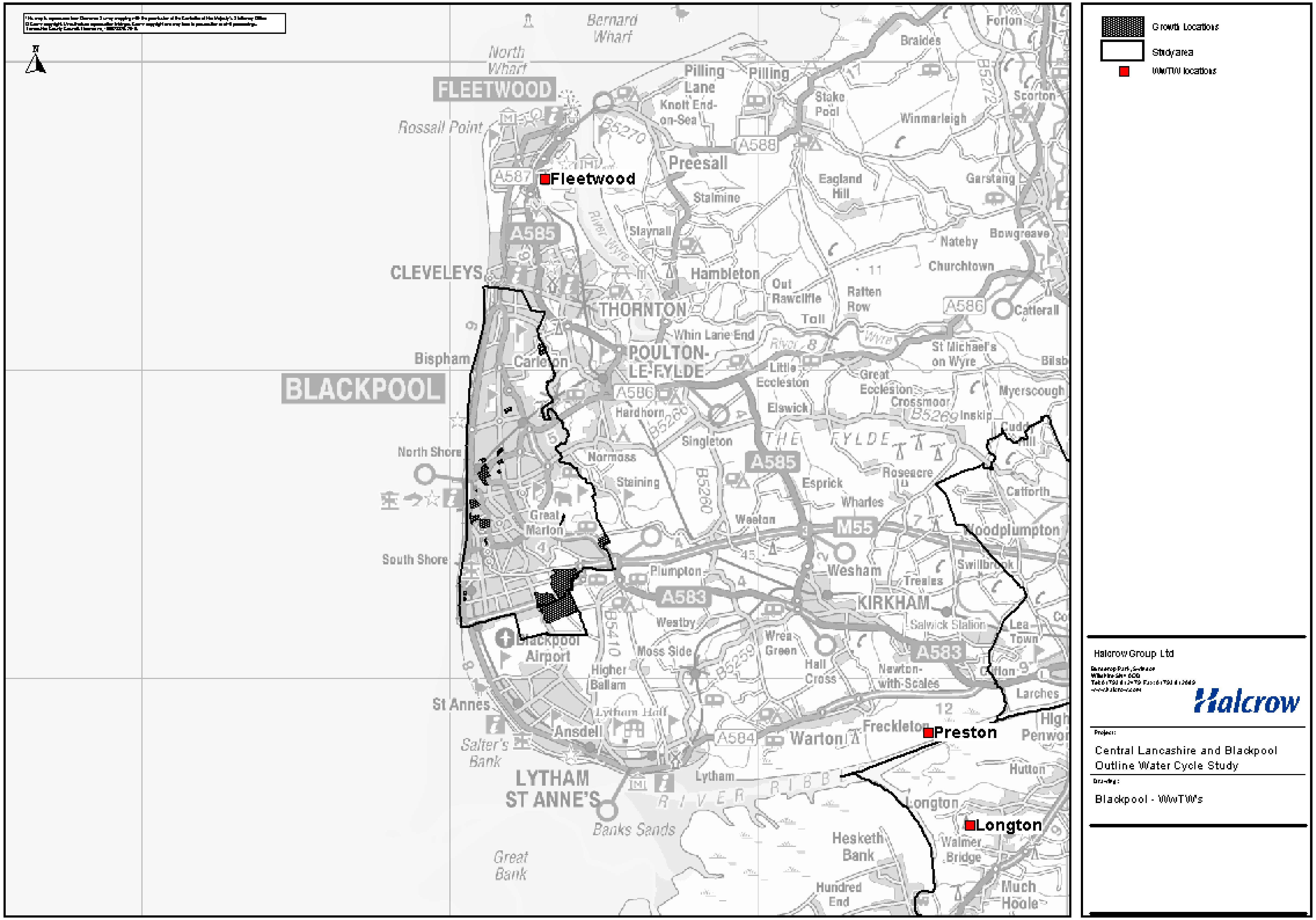

Figure 7-4: Wastewater Treatment Works locations in Blackpool Borough Council

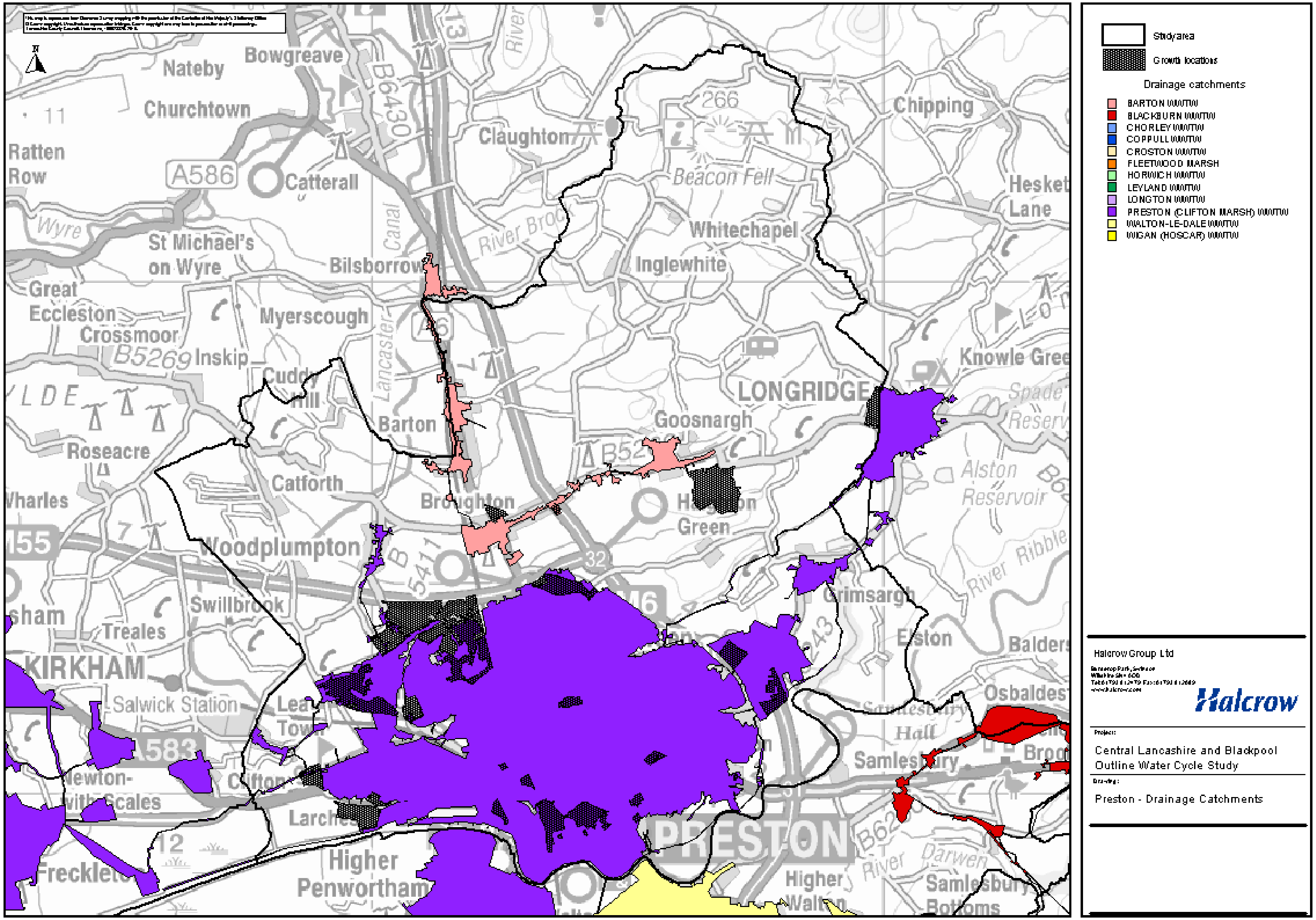

Figure 7-5: Wastewater Treatment Works drainage catchments in Preston City Council

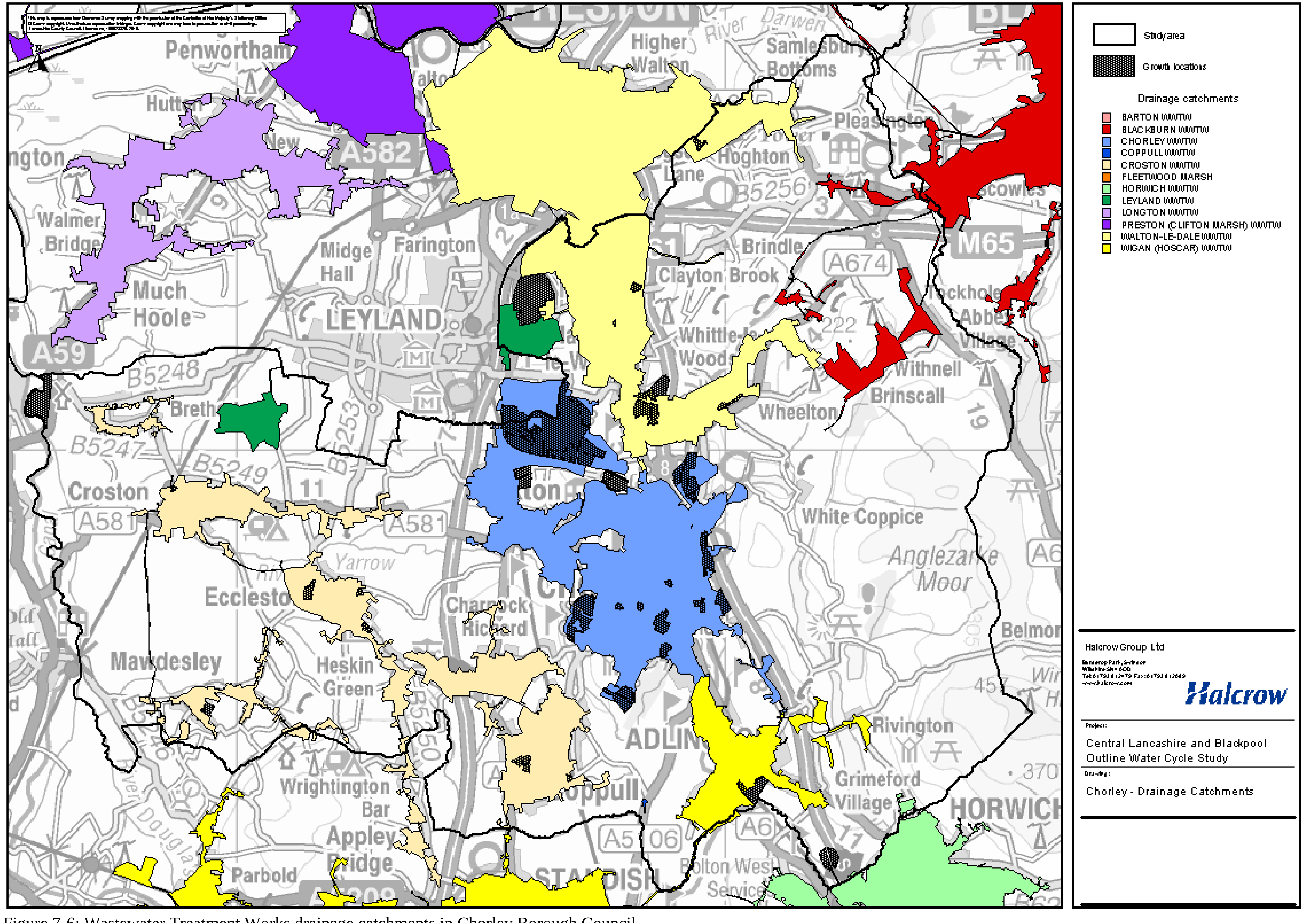

Figure 7-6: Wastewater Treatment Works drainage catchments in Chorley Borough Council

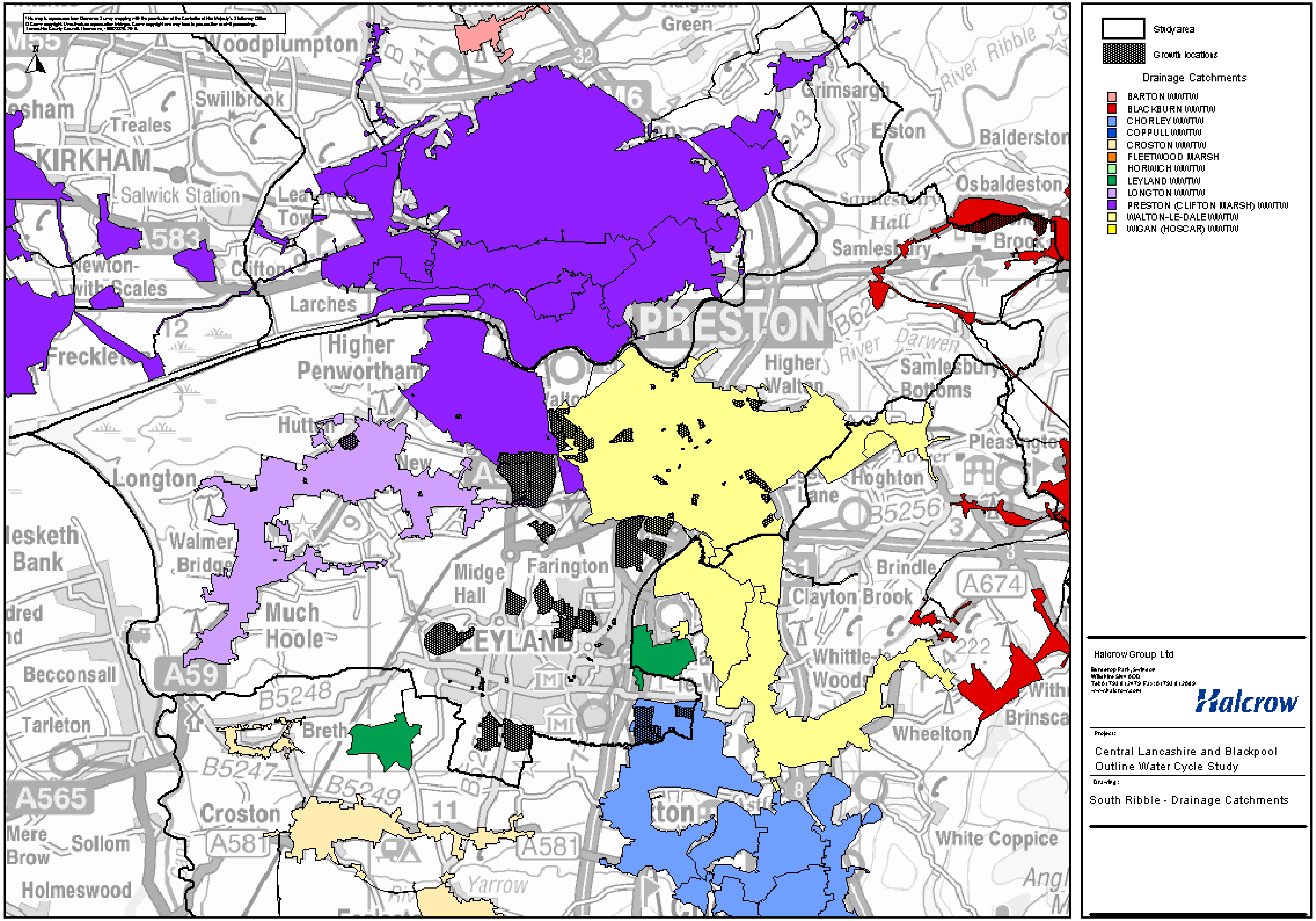

Figure 7-6: Wastewater Treatment Works drainage catchments in South Ribble Borough Council

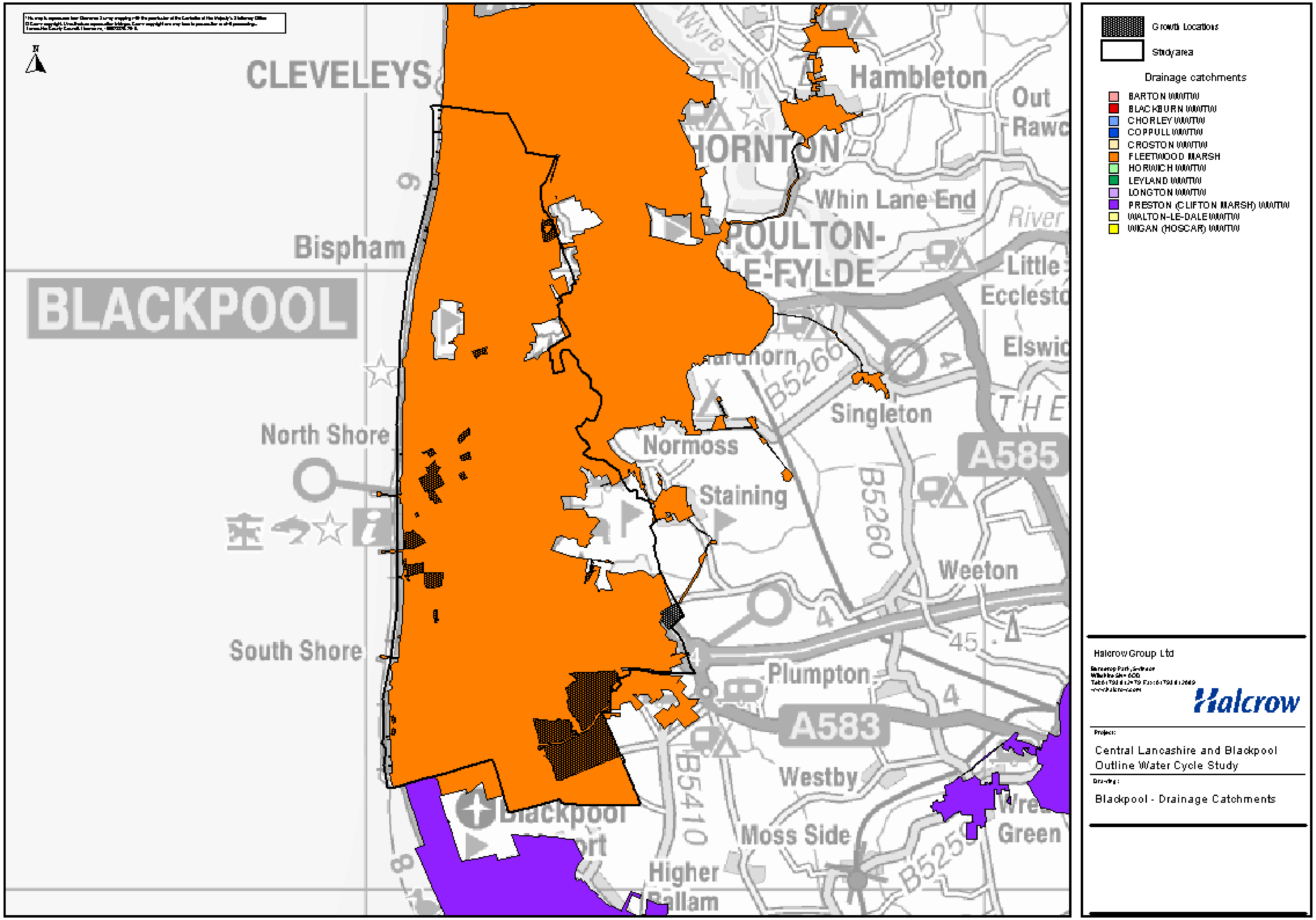

Figure 7-6: Wastewater Treatment Works drainage catchments in Blackpool Borough Council

Appendix B. Site Specific SUDS Analysis

APPENDIX B: Strategic assessment of surface water drainage for development sites

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
Central Business District	PE02	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's southern boundary.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Glacial Sand and Gravel	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.
Red Scar – Site F	PE08	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.2km and 0.3km from the site's eastern and western boundaries, respectively.	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.
Redscar 3	PE07	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.3km from the site's south eastern corner	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Redscar 1	PE05	Preston	A watercourse passes through the southern corner of the site	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Riversway (SS31)	PE04	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km from the site's eastern boundary	no	3	North of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till. South of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Alluvium.	Good prospects for infiltration in the south of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the north. Good prospects for attenuation due to nearby watercourse.
Broughton Business Park	PE03	Preston	A watercourse passes through the east of the site.	Part	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
Cottam Hall, off Tom Benson Way, Preston PO01	20	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.6km from the site's southern boundary.	no	3 (part)	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Lightfoot 1	12	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's northern boundary.	Part	Part none, 3 and 2	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Plus part of site is in SPZ 2 where extra precautions re treatment may be necessary. Good prospects for attenuation due to nearby watercourse. SPZ 2 may mean that extra treatment to improve water quality is required
Lightfoot 2	10	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's northern boundary.	Part	Part 3, part 2	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Plus extra precautions re treatment may be necessary within SPZ 2 and, especially, SPZ 1. Good prospects for attenuation due to nearby watercourse. SPZ 2 may mean that extra treatment to improve water quality is required
Whittingham Lane (Hudson and Walling)	UP05	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.6km from the site's southern boundary.	Yes	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Perry's Car Showroom, Blackpool Road (47)	SE10	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.5km from the site's southern boundary and 0.8km from the site's south western corner	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
GOSS Graphics	PEN03	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from the site's northern boundary.	no	none	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Cottam Hall Brickworks	PEN05	Preston	There are no known watercourses within the settlement boundary. The The southern boundary of the site adjoins the Lancaster canal.	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Parker Street, Preston	PO19	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.3km from the site's southern boundary.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Alstoms, Channel Way	PEN02	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.1km from the site's north western boundary and 0.2km from the site's south southern corner.	no	None	North of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till. South of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Alluvium.	Good prospects for infiltration in the south of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the north. Good prospects for attenuation due to nearby watercourses.
Whittingham Hospital Grounds	UP02	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 2km away to the south west.	Yes	None	Bedrock: Bowland High Group and Craven Group (Undifferentiated) – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Lightfoot 2	Lightfoot 2	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.3km from the site's northern boundary and 0.5km from the site's southern boundary.	Part (most)	2 (and very close to 1)	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse. SPZ 2 may mean that extra treatment to improve water quality

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
							is required.
Queen Street - Countryside Properties	UP01	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km from the site's southern boundary.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Glacial Sand and Gravel.	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.
Land off Whittingham Lane, Longridge	PO47	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 2.5km from the site's southern boundary.	Part	None	Bedrock: Bowland High Group and Craven Group (Undifferentiated) – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Alliance Works, Goodier Street and part of Manchester Mill	PEN01	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from the site's southern boundary.	no	3 (part)	West of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Glacial Sand and Gravel. East of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Good prospects for infiltration in the west of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the east. Good prospects for attenuation due to nearby watercourse.
Avenham Car Park, Avenham Street	UP03	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's southern boundary	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Glacial Sand and Gravel.	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.
Former St. Joseph's Orphanage, Theatre Street	UP12	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.5km from the site's southern boundary.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Glacial Sand and Gravel.	Good prospects for infiltration due to permeable geology. Good prospects for attenuation due to nearby watercourse.
Land at Eastway	PO03	Preston	A watercourse passes through the east of the site.	Part	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						Superficial: Till	nearby watercourse.
Crummock Road	OTHER1	Preston	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.6km from the site's south eastern boundary	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Brockholes/ Birley Bank	LP1	Preston	A watercourse passes through the west of the site.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Ingol Golf Club	PO71	Preston	A watercourse passes through the centre of the site.	no	1	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse. Infiltration may also be unfeasible due to SPZ 1.
Sharoe Green Hospital, Sharoe Green Lane	UC01	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.1km from the site's northern boundary and 0.4km from the site's southern boundary.	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Land to rear of Ryelands Crescent and Thurnham Road	UP04	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.2km from the site's southern boundary and 0.9km from the site's northern boundary.	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.
Land off Blackpool Road/Dodney Drive, Lea	PO44	Preston	A watercourse passes through the centre of the site.	no	3 (part)	North of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till. South of site:	Good prospects for infiltration in the south of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the north. Good prospects for attenuation due to nearby watercourses.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Alluvium.	
Land fronting the east side of Garstang Road, Broughton	PO14	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.4km from the site's north west corner and 0.9km from the site's south east boundary.	Yes	3 and 2	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses. SPZ 2 may mean that extra treatment to improve water quality is required
Spar Depot, Blackpool Road (47)	SE09	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.7km from the site's northern corner, 0.5km from the sites western boundary and 0.5km from the site's south east boundary.	no	3	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.
Tithebarn Regeneration Area	MRS1	Preston	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.4km from the site's southern boundary and 0.7km from the site's northern boundary.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Glacial Sand and Gravel.	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.
Golden Acres Ltd, Plocks Farm, Liverpool Road	09/00738/ FULMAJ	Chorley	A watercourse runs along the northern and western boundaries of the site.	Yes	None	Bedrock: Triassic Rocks (undifferentiated) – mudstone, siltstone and sandstone. Superficial: Alluvium	Good prospects for infiltration due to permeable geology. Also good prospects for attenuation due to nearby watercourse.
Bolton West Motorway Service Area Northbound	09/00837/ FULMAJ	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.2km from the site's western boundary and 0.3km from the site's southern boundary.	Yes	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.
Bolton West Motorway Service	09/00836/ FULMAJ	Chorley	There are no known watercourses within the settlement boundary. The	Yes	None	Bedrock: Pennine Lower Coal Measures Formation and South	Superficial Till may prevent infiltration being viable. Good

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
Area Southbound			nearest watercourses are about 0.3km from the site's western boundary and 0.3km from the site's southern boundary.			Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till	prospects for attenuation due to nearby watercourses.
M61/ Botany Site	ELR1	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km from the site's western boundary.	no	None	North of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Till South of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Glacial Sand and Gravel.	South of site good prospects for infiltration due to permeable geology. North of site superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.
Botany/ Great Knowley Site	ELR2	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's western boundary.	Part	None	North of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Till South of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Glacial Sand and Gravel.	South of site good prospects for infiltration due to permeable geology. North of site superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.
Group 1, Buckshaw Village	ELR37	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.1km from the site's north west corner.	Part	None	West of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till East of site (possibly*): Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Southern Commercial Area,	ELR38	Chorley	There are no known watercourses within the settlement boundary. The	no	None	West of site (possibly*):	Superficial Till may prevent infiltration being viable.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
Buckshaw Village			nearest watercourse is about 1.5km from the site's north west corner.			Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till East of site (possibly*): Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till	Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Regional Investment Site, Buckshaw Village	ELR39	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.3km from the site's south east corner.	no	None	West of site (possibly*): Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till East of site (possibly*): Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
East of A49	DC3.8	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.3km from the site's western boundary, 0.6km from the site's southern boundary and 0.2km from the site's eastern boundary.	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.
North of Euxton Lane	DC3.7	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses is about 0.7km from the site's eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Lex Auto Logistics, Pilling Lane	CHO10	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses is about 0.3km from the site's eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated)	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						Superficial: Till	
Cowling Mill, Cowling Road	CHO17	Chorley	A watercourse passes through the eastern part of the site.	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
William Lawrence Site, Townley Street	CHO18	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.8km from the site's northern boundary and about 0.8km from the site's south eastern boundary	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Railway Road	ADL04	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's south eastern boundary.	Yes	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Radburn Works, Sandy Lane	CLB02	Chorley	A watercourse meets the site's north west corner.	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Eaves Green, Chorley	CH004	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km from the site's eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Crosse Hall Fields, Chorley	CHO03	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from the site's south west corner.	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Talbot Mill, Chorley	CHO08	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.5km from the site's southern boundary.	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Sagar House, Langton Brow	ECC01	Chorley	There are no known watercourses within the settlement boundary. The	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and	Superficial Till may prevent infiltration being viable. Good

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
			nearest watercourse is about 0.1km from the site's south west boundary.			conglomerate, interbedded. Superficial: Till	prospects for attenuation due to nearby watercourse.
Land to West of Lucas Lane	WLW07	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km from the site's northern boundary.	Yes	None	South of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till. North of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Alluvium.	Superficial Till may prevent infiltration being viable in the south of the site, but it is likely to be possible in the north. Good prospects for attenuation due to nearby watercourse.
Land North of Town Lane	WLW05	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is less than 0.1km away along the site's northern boundary.	Yes	None	East of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till. West of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Alluvium.	Superficial Till may prevent infiltration being viable in the south of the site, but it is likely to be possible in the north. Good prospects for attenuation due to nearby watercourse.
Buckshaw Village Group 1	BUV02	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.5km away along the site's north west corner.	Part	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourses.
Buckshaw Village Group 4N	BUV03	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.0km away along the site's north west corner.	Part	None	West of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till. East of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourses.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						Superficial: Till.	
Re: Blainscough Works Blainscough Lane	COP02	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 1.9km away along the site's eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated). Superficial: Till.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Land at Waggon & Horses P.H. Chapel Lane	COP08	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.8km away from the site's eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Land at Duke Street	CHO45	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.0km from the site's south eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated). Superficial: Till.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Land at Parr Lane	ECC02	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.7km away from the site's southern boundary and 0.8km from the site's northern boundary.	no	None	North of site: Bedrock: Triassic Rocks (undifferentiated) – mudstone, siltstone and sandstone. Superficial: Till. South of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	In the north of the site, both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. In the south of the site there may be much more permeable bedrock but the superficial Till could still prevent infiltration. Reasonable prospects for attenuation due to nearby watercourse.
East of Tincklers Lane, Eccleston	ECC06	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.4km away from the site's southern boundary and 0.5km from the site's northern corner.	no	None	North of site: Bedrock: Triassic Rocks (undifferentiated) – mudstone, siltstone and sandstone. Superficial: Till.	In the north of the site, both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						South of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	less likely. In the south of the site there may be much more permeable bedrock but the superficial Till could still prevent infiltration. Good prospects for attenuation due to nearby watercourse.
Quarry Road	CHO25	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from the site's eastern boundary.	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Woodworks Site, Station Road	CRO01	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from the site's south eastern boundary.	no		North of site: Bedrock: Triassic Rocks (undifferentiated) – mudstone, siltstone and sandstone. Superficial: Till. South of site: Bedrock: Triassic Rocks (undifferentiated) – mudstone, siltstone and sandstone. Superficial: Alluvium.	The majority of the site overlies Alluvium where there is good potential for infiltration. In the north of the site superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Land at Crostons Farm, Lucas Lane	WLW10	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.3km from the site's north west corner.	Part (most)	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Vertex, Little Carr Lane	CHO34	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km from the site's eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated). Superficial: Till.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Land off Bolton Road	ADL09	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is <0.1km from the site's eastern boundary	Yes	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated).	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						Superficial: Till.	
Land behind and West of Blackburn Brow	CHO35	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.6km from the site's western boundary	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Glacial Sand and Gravel.	Good prospects for infiltration due to permeable geology. Reasonable prospects for attenuation due to nearby watercourses.
Land off Blainscough Lane	COP03	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.6km from the site's south east corner.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated). Superficial: Till.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
North Side Euxton Lane	CHO37	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.7km from the site's eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Land north of Euxton Lane	CHO38	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1km from the site's eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Land off New Street	OTV04	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.6km from the site's southern corner and 0.7km from the site's northern corner	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourses.
West of Blackburn Road	CHO28	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.5km from the site's western boundary	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Glacial Sand and Gravel.	Good prospects for infiltration due to permeable geology. Good prospects for attenuation due to nearby watercourses.
Land at Eaves Green 2	CHO33	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from the site's south eastern boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated)	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						Superficial: Till	
Land off Bournes Row	OTV02	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.4km from the site's north west corner.	no	None	East of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Till West of site (possibly*): Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Land off Blackburn Road	OTV06	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.0km from the site's northern boundary.	Yes	None	North/West of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Till South/East of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Glacial Sand and Gravel.	Where the site is underlain by Glacial Sand and Gravel there is a good prospect for infiltration. Where the site is underlain by superficial Till this may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Blainscough Works, Blainscough Lane	COP04	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.5km from the site's south east corner.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated). Superficial: Till.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Land at Park Mills/Oakwood Road	CHO06	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.9km from the site's north west corner.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated). Superficial: Till.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Buckshaw Village	BUV01	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.6km	Part	None	East of site (possibly*): Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone	Superficial Till may prevent infiltration being viable. Reasonable prospects for

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
			away from the site's north east corner and 1.0km from the site's north west corner.			Superficial: Till West of site (possibly*): Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	attenuation due to nearby watercourse.
Land to South of Euxton Lane Pear Tree Lane, Euxton	EUX02	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.3km from the site's north west boundary.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Cowling Farm, Cowling Road	CHO16	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km from the site's western boundary.	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse
Gillibrand, Chorley	CHO01	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is <0.1km from the site's western boundary.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated). Superficial: Till.	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Land at Eaves Green 1, Off Lower Burgh Lane	CHO32	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's western corner.	no	None	Bedrock: Pennine Lower Coal Measures Formation and South Wales Lower Coal Measures Formation (undifferentiated) Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Site 5, 7, 9 Buckshaw Avenue, Buckshaw Village	07/01395/ REMMAJ 2011	Chorley	There are no known watercourses within the settlement boundary. The nearest watercourse is about 1.3km from the site's south east corner.	no	None	West of site (possibly*): Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till East of site (possibly*):	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till	
Safeguarded Site i, Leyland Lane	SRE01	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is <0.1km along the site's western boundary.	Yes	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Pickerings Farm / Central Lancashire Urban Village	SRE02	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.6km from the site's western corner.	no	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse
Moss Side Test Track (NE Portion)	SRE05	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.5km from the site's eastern end and 0.7km from the site's south west corner.	Yes	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse.
Samlesbury Aerodrome	SRE07	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 1.5km from the site's northern boundary and 1.7km from the site's south east end.	no	None	Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Regional Investment Site (Cuerden)	SRE08	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from	Yes	None	North of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone,	In the south, the superficial Till may prevent infiltration being viable, but in the north infiltration prospects are good. Good

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
			the site's northern boundary.			Siltstone and Sandstone Superficial: Alluvium. South of Site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till.	prospects for attenuation due to nearby watercourse.
South Rings	SRE09	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from the site's northern corner.	Yes	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Alluvium.	Infiltration prospects are good due to permeable geology. Also good prospects for attenuation due to nearby watercourse.
Brackenhouse	SRE11	South Ribble	A watercourse passes through the centre of the site.	Yes	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Aldi Site, Matrix Park	SRE12	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.6km from the site's south west corner and about 0.7km from the site's northern boundary.	Yes	None	North of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till. South of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Low permeability geology in north of sites makes infiltration less likely. In the south of the site, superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Former Prestolite premises, Golden Hill Lane	GH4	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.3km from the site's southern boundary and	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
			about 0.3km from the site's north west corner.			Superficial: Till.	permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Lime Kiln Farm (Site h), Todd Lane North	TG6	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.2km from the site's north east corner.	no	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Farington Park, east of Wheelton Lane	FW9	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.3km from the site's southern boundary and about 0.2km from the site's northern boundary.	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
West of Grasmere Avenue (Site c), Grasmere Avenue	FW7	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.7km from the site's southern boundary and about 0.1km from the site's northern boundary.	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Roadferry	FW12	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.4km from the site's southern boundary and about 0.2km from the site's northern corner.	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Group One,	LSA4	South	There are no known watercourses	Yes	None	North of site (possibly*):	Low permeability geology in north

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
Buckshaw		Ribble	within the settlement boundary. The nearest watercourses are about 0.5km from the site's western boundary			Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till. South of site: Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	of sites makes infiltration less likely. In the south of the site, superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Arla Dairies, School Lane	BBN2	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.3km from the site's western boundary and 0.5km from the site's northern boundary.	no	None	West of site (possibly*): Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till. East of site (possibly*): Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Low permeability geology in west of sites makes infiltration less likely. In the east of the site, superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
The Foundry, Kittlingborne Brow	SW13	South Ribble	A watercourse runs through the centre of the site.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Alluvium	Good prospects for infiltration due to permeable geology. Good prospects for attenuation due to nearby watercourse.
Higher Walton Mills, Blackburn Road	SW14	South Ribble	A watercourse runs along the northern border of the site.	no	3 (part)	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Alluvium	Good prospects for infiltration due to permeable geology. Good prospects for attenuation due to nearby watercourse.
Safeguarded site b, Pickerings Farm	FW3	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.5km from the site's north west corner and 0.7km from the site's south east corner.	Part	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
							for attenuation due to nearby watercourse.
Schoolhouse Farm Development, Liverpool Road	NLH1	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.4km from the site's southern boundary and 0.6km from the site's northern boundary.	Part (border)	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Brownedge Road	BBW2	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.2km from the site's southern boundary.	Part (most)	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
South Part of allocation f, east of Leyland Road	TG7	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 1.3km from the site's southern boundary and 1.3km from the site's eastern boundary.	no	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Lostock Hall Gas Works, Leyland Road	TG3	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 1.5km from the site's southern boundary, 1.0km from the site's eastern boundary and 1.3 from the site's northern boundary.	no	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Safeguarded site	BBE7	South	There are no known watercourses	no	None	Bedrock: Triassic rocks	Superficial Till may prevent

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
c(6), Brindle Road		Ribble	within the settlement boundary. The nearest watercourse is about 0.8km from the site's north east corner.			(undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Safeguarded site a north part, South of Factory Lane	MF1	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.9km from the site's northern boundary, 1.5km from the site's eastern boundary and 1.6 from the site's western boundary.	no	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse.
Safeguarded site e, Wade Hall	LOW1	South Ribble	A watercourse passes through the north east corner of the site.	Yes	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Land at Riverside/ Lostock Lane	BBW7	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is <0.1km from the site's northern boundary.	Yes	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Alluvium.	Infiltration prospects are good due to permeable geology. Also good prospects for attenuation due to nearby watercourse.
Leyland andBirmingham Rubber Works and Adjacent Land, Golden Hill Lane	GH2	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.2km from the site's southern boundary, 0.4km from the site's northern boundary and 0.2km from the site's eastern edge.	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Safeguarded site A, Southern Part	CH2	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 1.4km from the site's northern boundary, 1.5km from the site's eastern boundary	no	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
			and 1.6km from the site's southern boundary and 1.7km from the site's western boundary.				less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Vernon Carus Site, Factory Lane	MF2	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 1.0km from the site's northern boundary, 1.3km from the site's eastern boundary and 1.9km from the site's southern boundary and 1.9km from the site's western boundary.	no	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Wesley Street Mills	BBE1	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's south west corner.	no	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till	Superficial Till may prevent infiltration being viable. Good prospects for attenuation due to nearby watercourse.
Moss Side Test Track, Aston Way	MS2	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.3km from the site's south west boundary and 0.7km from the site's north east boundary.	Yes	None	Bedrock: Triassic rocks (undifferentiated) – mudstone, siltstone and sandstone. Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Safeguarded site d, Flensburg Way	FW2	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.4km from the site's south west corner.	Yes	None	Bedrock: Triassic rocks (undifferentiated) – mudstone, siltstone and sandstone. Superficial: Peat	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Brindle Road (Site	LPm	South	There are no known watercourses within the settlement boundary. The	no	None	North of site:	Superficial Till may prevent infiltration being viable.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
M)		Ribble	nearest watercourses are about 1.5km from the site's southern corner and 1.3km from the site's northern boundary.			Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till South of site (possibly*) Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till	Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Kellett Lane (Site K)	LPk	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 1.3km from the site's western boundary and 1.0km from the site's southern boundary	no		North of site (possibly*): Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till South of site: Bedrock: Millstone Grit Group – mudstone, siltstone and sandstone. Superficial: Till	Superficial Till may prevent infiltration being viable. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers).
Brackenhouse Properties (site c)	LPc	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.7km from the site's southern boundary and about 0.1km from the site's northern boundary.	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Slater Lane (Expac)	LPo	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.1km from the site's eastern boundary	Yes	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
Church Lane (Site h)	LPh	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km from the site's south eastern border.	Yes	None	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Parcel A3, Buckshaw Village	LSA7	South Ribble	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.8km away from the site's western boundary and 1.0km from the site's northern boundary.	Yes	None	Bedrock: Triassic rocks (undifferentiated) - sandstone and conglomerate, interbedded. Superficial: Till.	Superficial Till may prevent infiltration being viable. Reasonable prospects for attenuation due to nearby watercourse.
Land at Seasiders Way/Unit 1 - 5 Baron Way	SC/037	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourse is about 2.3km away from the site's eastern boundary. The sea is about 0.6km away from the site's western boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Blown Sand	Whilst the bedrock is fairly low permeability, the Blown Sand is probably more permeable. However, the proximity to the sea may result in high groundwater levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Land off Coopers Way	SC/005	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourses are about 1.6km away from the sites north east corner and 2km away from the sites eastern border. The sea is about 1km away from the site's western boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
							non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Ryscar Way/Kincraig Road	SN/007	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.15km away from the site's eastern boundary. The sea is about 1.9km away from the site's western boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse, or alternatively to the sea.
Ryscar Way/Kincraig Road (Phase 2)	SN/009	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.05km away from the site's eastern boundary. The sea is about 2km away from the site's western boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse, or possibly directly to the sea.
Leys Nursery, Leys Road	SN/017	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.7km and 2km away from the site's eastern boundary. The sea is about 1.2km away from the site's western boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Reasonable prospects for attenuation due to nearby watercourse, or alternatively to the sea.
Marton Moss: Bennets Lane/Progress Way (M55 Growth Hub)	SS/051	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourses are about 0.5km away from the site's eastern boundary and 0.6km and 0.8km away from the site's southern boundary.	no	no	West of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Blown Sand	Good prospects for infiltration in the west of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the east. Reasonable prospects for attenuation due to nearby watercourse.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						East of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	
Talbot Gateway	SC/016	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourses are about 2.3km and 2.7km away from the site's eastern corner. The sea is about 0.4km away from the site's western corner.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Marton Moss: Yeadon Way/Progress Way (M55 Growth Hub)	SS/052	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.2km away from the site's southern boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Good prospects for attenuation due to nearby watercourse.
Marton Moss: Progress Way to School Road (M55 Growth Hub)	SS/053	Blackpool	A watercourse runs along the site's eastern boundary and another watercourse is about 0.1km away from the site's southern boundary.	no	no	West of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Blown Sand North east of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone,	Good prospects for infiltration in the west and south east of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the north east. Good prospects for attenuation due to nearby watercourse.

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
						Siltstone and Sandstone Superficial: Till South east of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Alluvium	
Whyndyke Farm (M55 Growth Hub)	CSM1	Blackpool	There is a watercourse at the site's northern corner (possibly also running underground through the site).	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till North east of site (possibly*): Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Alluvium	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. However there is a possibility that a small part of the north of the site overlies the more permeable Alluvium. Good prospects for attenuation due to nearby watercourse.
Blackpool & Fylde College NB: this was not included in the GIS layer, therefore deduced from SHLAA pdf.	SN/035	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourse is about 0.5km away from the site's eastern boundary.	no	no	North of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Alluvium South of site: Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Good prospects for infiltration in the north of the site due to permeable geology. Superficial Till may prevent infiltration being viable in the south. Good prospects for attenuation due to nearby watercourse.
South Beach Regeneration Site (569-589/600-613 New South	SS/054	Blackpool	This site is split into two parts. There are no known watercourses within the settlement boundary. The nearest watercourses are about 3.0km,	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Blown Sand	Whilst the bedrock is fairly low permeability, the Blown Sand is probably more permeable. However, the proximity to the sea

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
Promenade)			3.1km and 3.4km away from the northern part's eastern boundary. The nearest watercourses are about 2.9km, 3.0km and 3.4km away from the southern part's eastern boundary The sea is about 0.61m away from both parts' western boundary.				may result in high groundwater levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Sawmills, Caunce Street	SC/015	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourses are about 2.2km away from the site's eastern boundary. The sea is about 1km away from the site's western corner.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Former Devonshire Road Hospital	SC/063	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourses are about 2km away from the site's eastern boundary. The sea is about 1km away from the site's western corner.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Cocker Street Industrial Estate	SC/064	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourses are about 2.6km	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
			and 2.7km away from the site's eastern corner. The sea is about 0.4km away from the site's western corner.			Superficial: Till	layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Foxhall Regeneration Site	SC/086	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourse is about 2.3km away from the site's eastern boundary. The sea is about 0.1km away from the site's western border.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Blown Sand	Whilst the bedrock is fairly low permeability, the Blown Sand is probably more permeable. However, the proximity to the sea may result in high groundwater levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Land off Cornwall Place	SE/025	Blackpool	A watercourse runs along the site's northern border.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Alluvium	Good prospects for infiltration due to permeable superficial geology. Also good prospects for attenuation due to nearby watercourse.
Rigby Road Site (developed in place of GR15 (above) which will remain education	CSR13	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourse is about 2km away from the site's eastern boundary. The sea is about 0.4km away from the site's western boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Blown Sand	Whilst the bedrock is fairly low permeability, the Blown Sand is probably more permeable. However, the proximity to the sea may result in high groundwater levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult due to

Settlement	Ref	Borough	Watercourses	NVZ	SPZ	Geology	SUDS likely to be suitable
							distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Former Central Station/ Promenade Strategic Town Centre Site	CSR10	Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourse is about 2.3km away from the site's eastern corner. The sea is about 0.1km away from the site's western boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Blown Sand	Whilst the bedrock is fairly low permeability, the Blown Sand is probably more permeable. However, the proximity to the sea may result in high groundwater levels which prevent infiltration being feasible. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.
Hounds Hill Shopping Centre Phase 2		Blackpool	There are no known watercourses within the settlement boundary. The nearest watercourses are about 2.5km and 3.2km away from the site's eastern boundary. The sea is about 0.3km away from the site's western boundary.	no	no	Bedrock: Triassic Rocks (Undifferentiated) – Mudstone, Siltstone and Sandstone Superficial: Till	Both the bedrock (which is aquifer type Secondary B, a fairly low permeability rock) and superficial layer are relatively low permeability making infiltration less likely. Attenuation to a watercourse may be made more difficult due to distance involved (but there may be some nearer non main rivers). Attenuation with discharge directly to the sea is probably more viable.

*difficult to tell where site borders are relative to the bounds of the geological rock types, therefore there is some uncertainty about which underlies the site

Appendix C. List of acronyms

AMP – Asset Management Plan

BAT – Best Available Technology (also called limit of conventional treatment)

BOD – Biochemical Oxygen Demand

CFMP – Catchment Flood Management Plan

CSH – Code for Sustainable Homes

CSO – Combined Sewer Overflow

DO – Deployable Output

DWF – Dry Weather Flow

dWRMP – draft Water Resource Management Plan

FRA – Flood Risk Assessment

GOWM – Government Office West Midlands

GSPZ – Groundwater Source Protection Zone

HRA – Habitats Regulations Assessment

LDF – Local Development Framework

LPA – Local Planning Authority

LSOA – Lower Super Outputs Area

NEP – National Environment Programme

NHPAU – National Housing and Planning Advice Unit

NLP – Nathaniel Lichfield & Partners

NVZ – Nitrate Vulnerable Zone

ONS – Office of National Statistics

PCC – Per Capita Consumption

PE – Population Equivalent

PPS1 – Planning Policy Statement 1: Delivering Sustainable Development

PPS25 – Planning Policy Statement 25: Development and Flood Risk

RFRA – Regional Flood Risk Appraisal

RNC – River Needs Consent

RQP – River Quality Planning (Toolkit)

RSA – Restoring Sustainable Abstraction

SFRA – Strategic Flood Risk Assessment

SoR – Statement of Response

STW – Severn Trent Water

SUDS – Sustainable Urban Drainage Systems

TSS – Total Suspended Solids

UID – Unsatisfactory Intermittent Dsischarges

UPM – Urban Pollution Management

WAFU – Water Available for Use

WCS – Water Cycle Study

WFD – Water Framework Directive

WRZ – Water Resource Zone

WTW – Water Treatment Works

WwTW – Wastewater Treatment Works

Appendix D. Glossary of terms

Annual Monitoring Report (AMR) - Assesses the implementation of the Local Development Scheme and the extent to which policies in Local Development Documents are being successfully implemented.

Appropriate Assessment – same as Habitats Regulation Assessment, please see this definition.

Area Action Plans – Development Plan Documents that provide a planning framework for areas of change and areas of conservation.

Areas of Outstanding Natural Beauty (AONB) - Were brought into being by the same legislation as National Parks - the National Parks and Access to the Countryside Act of 1949. They are fine landscapes, of great variety in character and extent. The criteria for designation is their outstanding natural beauty. Many AONBs also fulfil a recreational role but, unlike national parks, this is not a designation criteria. The Countryside Agency and the Countryside Council for Wales are responsible for designating AONBs and advising Government on policies for their protection.

Asset Management Plan (AMP) - a plan for managing an water companies' infrastructure and other assets in order to deliver an agreed standard of service. The Asset Management Plans are submitted to Ofwat every 5 years and forms the basis by which water rates are set. These plans identify the timescales and levels of investment required to maintain and upgrade the serviceability of the assets.

Biodiversity Action Plans (BAPs) – The UK initiative, in response to the Rio Summit in 1992, to conserve and enhance biodiversity. The plan combines new and existing conservation initiatives with the emphasis on a partnership approach and seeks to promote public awareness.

BREEAM - The Building Research Establishment Environmental Assessment Method. A method for assessing the environmental sustainability of a new building. The BREEAM has been superseded by the Code for Sustainable homes for residential developments, but is still in common usage for non-residential developments.

Catchment Abstraction Management Strategy (CAMS) – a strategy to assess how much water can be abstracted to meet its many economic uses – agriculture, industry, and drinking water supply – while leaving sufficient water in the environment to meet ecological needs.

Catchment Flood Management Plan (CFMP) – A strategic planning tool through which the Environment Agency seeks to work with other key decision-makers within a river catchment, to identify and agree policies for sustainable flood risk management.

Code for Sustainable Homes – the Code for Sustainable Homes - a new national standard for sustainable design and construction of new homes—was launched in December 2006. The code measures the sustainability of a new home against a range of sustainability criteria. The code sets minimum standards for energy and water use in new properties, and gives homebuyers more information about the environmental impact of their new home.

Combined Sewer Overflow (CSO) - Combined sewer overflow is the discharge of untreated wastewater from a sewer system that carries both sewage and storm water (a combined sewerage system) during a rainfall event. The increased flow caused by the storm water runoff exceeds the sewerage system's capacity and the sewage is forced to overflow into streams and rivers through CSO outfalls.

Communities and Local Government (CLG) - Communities and Local Government is the government department responsible for policy on local government, housing, urban regeneration, planning and fire and rescue. They have responsibility for all race equality and community cohesion related issues in England and for building regulations, fire safety and some housing issues in England and Wales. The rest of their work applies only to England.
(http://www.communities.gov.uk/corporate/about/)

Core Strategy - The Development Plan Document which sets the long-term spatial planning vision and objectives for the area. It contains a set of strategic policies that are required to deliver the vision including the broad approach to development.

Development Plan - As set out in Section 38(6) of the Planning and Compulsory Purchase Act (2004), an authority's development plan consists of the relevant Regional Spatial Strategy (or the Spatial Development Strategy in London) and the Development Plan Documents contained within its Local Development Framework.

Development Plan Documents (DPDs) - Spatial planning documents within the Council's Local Development Framework which set out policies for development and the use of land. Together with the Regional Spatial Strategy they form the development plan for the area. They are subject to independent examination. They are required to include a core strategy and a site allocations document, and may include area action plans if required; other DPDs may also be included, e.g. development control policies.

DEFRA - Department of Environment, Food and Rural Affairs Development

Environment Agency - The leading public body for protecting and improving the environment in England and Wales. Flood management and defence are a statutory responsibility of the Environment Agency; it is consulted by local planning authorities on applications for development in flood risk areas, and also provides advice and support to those proposing developments and undertaking Flood Risk Assessments. The Environment Agency reports to DEFRA.

Environment Agency Flood Zones - Nationally consistent delineation of 'high' and 'medium' flood risk, published on a quarterly basis by the Environment Agency.

Flood Estimation Handbook - The latest hydrological approach for the estimate of flood flows in the UK.

Flood Risk Assessment – A site specific investigation usually carried out by the site developers to be submitted as part of their planning applications. It assesses both current flood risk to the site and the impact of development of the site to flood risk in the area.

Freshwater Fish Directive - The EC Directive on Freshwater Fish is designed to protect and improve the quality of rivers and lakes to encourage healthy fish populations. In 2013, this directive will be repealed. Waters currently designated as Fish Directive waters will become protected areas under the Water Framework Directive.

Future Water - The Government's new water strategy for England, Future Water was published 7 February 2008. This strategy sets out the Government's long-term vision for water and the framework for water management in England. (http://www.defra.gov.uk/Environment/water/strategy/index.htm)

Habitats Regulation Assessment - Required by the Habitats Directive (92/43/EEC) for all plans or projects which, either alone or in combination with other plans or projects, would be likely to have a significant effect on a European classified conservation site, and are not directly connected with the management of the site for nature conservation. Its purpose is to assess the implications of a proposal in respect to the site's conservation objectives. The assessment process is not specified by the regulations but is usually an iterative process at a level dependent on the location, size and significance of the proposed plan or project. Natural England can advise on whether a plan or project is likely to have a significant effect and thus require assessment.

Infrastructure – The basic physical systems of a community's population, including roads, utilities, water, sewage, etc. These systems are considered essential for enabling productivity in the economy. Developing infrastructure often requires large initial investment, but the economies of scale tend to be significant. Water services infrastructure refers to infrastructure that provides clean water, urban drainage and wastewater services.

Inset appointment - An inset appointment is made when an existing water and/or sewerage undertaker is replaced by another as the supplier of water and/or sewerage services for one or more customers within a specified geographical area.

Local Authority or Local Planning Authority (LA or LPA) – the local authority or council that is empowered by law to exercise planning functions. Often the local borough or district council. National parks and the Broads authority are also considered to be local planning authorities. County councils are the authority for waste and minerals matters.

Local Development Documents (LDDs) – the collective term for Development Plan Documents and Supplementary Planning Documents.

Local Development Framework (LDF) - The name for the portfolio of Local Development Documents. It consists of the Local Development Scheme, a Statement of Community Involvement, Development Plan Documents, Supplementary Planning Documents, and the Annual Monitoring Report.

Local Development Scheme (LDS) - Sets out the programme for preparing Local Development Documents. All authorities must submit a Scheme to the Secretary of State for approval within six months of commencement of the 2004 Act (thus all authorities should now have submitted an LDS). LDSs are subject to review.

'Making Space for Water' (DEFRA 2004) - The Government's new evolving strategy to manage the risks from flooding and coastal erosion by employing an integrated portfolio of approaches, so as to: a) reduce the threat to people and their property; b) deliver the greatest environmental, social and economic benefit, consistent with the Government's sustainable development principles, and c) secure efficient and reliable funding mechanisms that deliver the levels of investment required.

National Environment Programme - The NEP is a list of environmental improvement schemes that ensure that water companies meet European and national targets related to water. The NEP is produced by the Environment Agency after consultation with the water industry and a number of other organisations. Companies incorporate these requirements into their proposed business plans, which inform Ofwat's decision on prices.

Ofwat – The Water Services Regulation Authority (Ofwat) is the body responsible for economic regulation of the privatised water and sewerage industry in England and Wales. Ofwat is primarily responsible for setting limits on the prices charged for water and sewerage services, taking into account proposed capital investment schemes (such as building new wastewater treatment works) and expected operational efficiency gains.

Outage - A temporary loss of water available from a source due to planned or unplanned events. An outage is temporary in the sense that it is retrievable, and therefore the amount of water a source can provide can be recovered.

Planning Policy Statements (PPS) - The Government has updated its planning advice contained within Planning Policy Guidance Notes (PPGs) with the publication of new style Planning Policy Statements (PPSs), which set out its policy for a range of topics.

Pollutants – A substance or condition that contaminates air, water, or soil. Pollutants can be artificial substances, such as pesticides and PCBs, or naturally occurring substances, such as oil or carbon dioxide, that occur in harmful concentrations in a given environment

Previously Developed (Brownfield) Land - Land which is or was occupied by a building (excluding those used for agriculture and forestry). It also includes land within the curtilage of the building, for example a house and its garden would be considered to be previously developed land. Land used for mineral working and not subject to restoration proposals can also be regarded as Brownfield land.

QMED – The median annual maximum flood flow.

Regional Spatial Strategy (RSS) - Sets out the region's policies in relation to the development and use of land and forms part of the development plan for local planning authorities.

River Basin Management Plan (RBMP) – A strategic tool introduced by the Water Framework Directive (2000/60/EC) which integrates the management of land and water within a river basin (river catchment or group of catchments). The river basin may cover several political areas.

River Quality Objective (RQO) – agreed by Government as targets for all rivers in England and Wales when the water industry was privatised in 1989. The targets specify the water quality needed in rivers if we are to be able to rely on them for water supplies, recreation and conservation.

Simplified Monte Carlo Analysis – The Monte Carlo method is based on the generation of multiple trials to determine the expected value for a random variable.

Sites of Importance for Nature Conservation (SINCs) - is a designation used in many parts of the United Kingdom to protect areas of importance for wildlife at a county.

Site of Special Scientific Interest (SSSI) – a site identified under the Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000) as an area of special interest by reason of any of its flora, fauna, geological or physiographical features (basically, plants, animals, and natural features relating to the Earth's structure).

Source Protection Zones (SPZs) – The Environment Agency has defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied to a groundwater source. (http://www.environment-agency.gov.uk/maps/info/groundwater/?version=1&lang=_e)

Statement of Community Involvement (SCI) - Sets out the standards which authorities will achieve with regard to involving local communities in the preparation of local development documents and development control decisions. It is subject to independent examination.

Strategic Environmental Assessment (SEA) - A generic term used to describe environmental assessment as applied to policies, plans and programmes. The European 'SEA Directive' (2001/42/EC) requires a formal 'environmental assessment of certain plans and programmes, including those in the field of planning and land use'.

Strategic Flood Risk Assessment (SFRA) – a Level 1 SFRA is a district-wide assessment of flood risk, usually carried out by a local authority to inform the preparation of its Local Development Documents (LDDs) and to provide the information necessary for applying the Sequential Test in planning development. A Level 2 SFRA is a more detailed assessment produced where the Exception Test is required for a potential development site, or to assist in evaluating windfall planning applications.

Strategic Housing Land Availability Assessment (SHLAA) - A SHLAA is an assessment of the potential of a borough to accommodate housing development over a period of 15 years from the date of adoption of the LDF Core Strategy. The SHLAA forms part of the evidence base for the emerging Local Development Framework (LDF), and inform the identification of potential new housing sites to be allocated in the LDF.

Super Output Areas (SOA) – a new national geography created by the Office for National Statistics (ONS) for collecting, aggregating and reporting statistics.

Supplementary Planning Documents (SPDs) - Provide supplementary information in respect of the policies in Development Plan Documents. They do not form part of the Development Plan and are not subject to independent statutory examination, but are normally subject to public consultation.

Sustainability Appraisal (SA) - Tool for appraising policies to ensure they reflect sustainable development objectives (i.e. social, environmental and economic factors) and required in the 2004 Act to be undertaken for all local development documents. It incorporates Strategic Environmental Assessment.

Sustainable Development – "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (The World Commission on Environment and Development, 1987).

Sustainable Drainage Systems (SUDS) – Surface water drainage systems which manage runoff in a more sustainable way than conventional drainage, through improved methods of managing flow rates, protecting or enhancing water quality and encouraging groundwater recharge. A variety of types are available and can be chosen as appropriate for the location and needs of the development, and many have added benefits such as enhancement of the environmental setting, provision of habitat for wildlife and amenity value for the community.

The Sequential Test - Informed by a Strategic Flood Risk Assessment, a planning authority applies the Sequential Test to demonstrate that there are no reasonably available sites in areas with less risk of flooding that would be appropriate to the type of development or land use proposed.

Water Framework Directive (WFD) – a European Union directive which commits member states to making all water bodies (surface, estuarine and groundwater) of good qualitative and quantitative status by 2015.

Water neutrality - If a development is to be 'water neutral' then the total demand for water should be the same after the new development is built, as it was before. That is, the new demand for water should be offset in the existing community by making existing homes and buildings in the area more water efficient. (http://www.environment-agency.gov.uk/research/library/publications/40737.aspx)

Water stress - Water stress occurs when the demand for water exceeds the available amount during a certain period or when poor quality restricts its use. Water stress causes deterioration of freshwater resources in terms of quantity (e.g. aquifer overexploitation or dry rivers) and quality (eutrophication, organic matter pollution, and saline intrusion).

Water resource zone – a geographical area defined by the water supply/demand balance in the region such that all customers within it receive the same level of service in terms of reliability of water supply.

Water Resource Management Plans (WRMP) - Water companies in England and Wales have a statutory duty to prepare, consult, publish and maintain a water resources management plan under new sections of the Water Industry Act 1991, brought in by the Water Act of 2003. Water resource management plans show how the water companies intend to supply your water over the next 25 years. In doing so, they need to take into account population changes, climate change and protecting the environment from unnecessary damage caused by taking too much water for use.

Water resource zone – a geographical area defined by the water supply/demand balance in the region such that all customers within it receive the same level of service in terms of reliability of water supply.