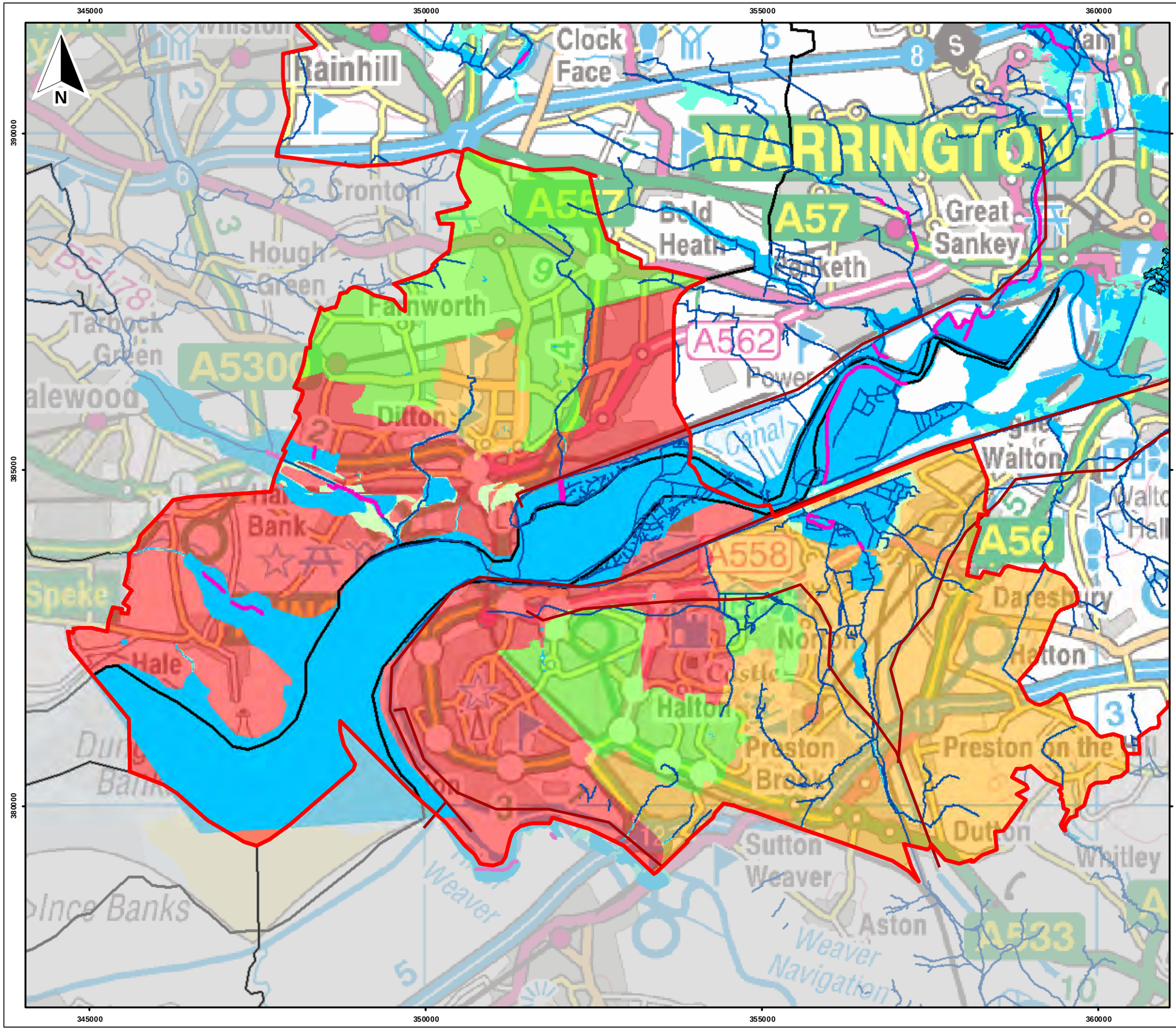


Key:

- Mid Mersey study area
- Neighbouring local authorities
- Watercourses
- Canal
- Flood defences
- Area benefiting from flood defence
- Flood zone 3
- Flood zone 2

Area of ward in flood zone 3:

- Low <1.5%
- Medium 1.5% to 10%
- High >10%

Flood Zone data:
Based on the Halton SFRA Level 2
Flood Zone 3 Extent

0 0.25 0.5 1 1.5 2 2.5
Kilometers
Scale: 1:55,000 @ A3

H:\Projects\28467 Mid Mersey WCS\Drawings\GIS\28467-W03b.mxd

Mid Mersey Outline Water Cycle Study

Figure 4.8b
Flood Risk in Halton
Halton SFRA Flood Extents

March 2011
28467-W03b BREAR

Entec

Warrington SFRA

A Level 2 SFRA was completed in draft in December 2010 and will be finalised in early 2011. This more detailed SFRA represents the Level 1 SFRA with new data produced during more detailed investigations. Volume I covers flood risk guidance for Warrington, and Volume II presents the detailed flood risk mapping and assessment. All sources of flooding are covered (tidal, fluvial, surface water, groundwater, flood defences, sewers, canals, other artificial structures/systems (i.e. embankments, culverts and pumping stations)). Surface water flooding has been assessed based on the Environment Agency mapping and the collation of historic event information (surface water incidents, sewer flooding), to determine Critical Drainage Areas (CDAs). Broadly, flood risk falls into three categories: the Mersey Estuary coastal area (although the majority of the low-lying area is undeveloped saltmarsh); flooding associated with individual smaller watercourses distributed across the borough with more complicated and varied flood risk issues, typically including issues such as constriction by culverts/development and some which require pumping into canals/the tidal Mersey; and catchments where surface water flooding and capacity issues in the piped drainage system interact to cause flood incidents. The SFRA takes a catchment-by-catchment approach to fluvial flooding, to identify the key issues within each of catchments that drain to the smaller watercourses.

Surface water flooding is assessed in detail (SFRA s4.2) based on historic records and the Environment Agency's first and second generation surface water flooding data sets. Multiple CDAs have been identified (see SFRA s 4.4) with Table 4.2 detailing the six CDAs in north-west Warrington. The existing Surface Water Management Plan (SWMP) for north-west Warrington, recommends that all the CDAs are assessed in more detail. The SFRA provides guidance on SuDS, with details of suitable types, acceptability and the criteria for limiting runoff rates.

The extent of fluvial/tidal flood risk in Warrington is complicated by the conveyance of flood water via the Manchester Ship Canal (MSC) which combines with the Mersey Estuary to convey flows out of the catchment. This system had not been modelled accurately in-combination until recently. It is understood that the standard Environment Agency flood zones slightly overestimate the extent of flood risk, whereas the 2006 modelling which includes the Ship Canal shows a less extensive corridor of flood risk. The SFRA includes both the EA Flood Zones, and the more detailed flood extents with inclusion of the Ship Canal's conveyance. Locally, there has been no fluvial flooding from the Mersey since the construction of the Ship Canal in 1894. The Environment Agency is currently undertaking more detailed mapping of flood risk from the MSC and will be issuing updated flood mapping for the MSC in February/March 2011.

Section 7 of the SFRA vII details the flood risk to development sites. In particular, flood risk to the Central Warrington Strategic Site and the Warrington Waterfront area. Revised flood mapping, surface water mapping and depth and hazard mapping is used to inform the development guidance for these areas. The SFRA includes an investigation into how development in the latter area, which is subject to tidal/fluvial flooding, could increase flood depths elsewhere due to reduction in storage/conveyance.

The following key areas of flood risk are identified in inner Warrington:

- Tidal: River Mersey is the key source of flood risk for much of central Warrington;

- Sankey Brook to the west (i.e. Bewsey).

At Sankey and Penketh (west of inner Warrington):

- Tidal from the River Mersey;
- Sankey, Whittle and Penketh Brooks as well as the Barrow's Green Brook and Barrow Brook tributaries. Long sections of these watercourses are culverted in this area, and there are formal defences along the Whittle Brook. Key flood risk areas on the Sankey Brook are at the Gemini Business Park and Sankey Bridges. The Level 2 SFRA suggests these areas should be classified as Flood Zone 3b. Section 3.5.2 details specific locations where flood risk is posed to adjacent development. Detailed modelling (SFRA s3.5.4) shows a complex interaction between the Penketh and Whittle Brooks, with culverts surcharging during high-flow events and constricting structures influencing the extent of flood zones along the brooks.

At Burtonwood, Winwick, Westbrook, Gemini and Bewsey (west of inner Warrington):

- Sankey Brook and tributaries – Phipps Brook, Causey Brook, Dallam Brook, Mill Brook and North Park Brook. Notable sections of these watercourses are culverted in this area, and there are formal defences along the Sankey Brook.

At Padgate, Orford, Fearnhead and Woolston (North east of inner Warrington):

- Sankey Brook, as well as the Padgate Brook, the Spittal Brook and its tributaries, the Cockshot and Cross Brooks. At Longford, the interaction of the Longford and Dallam watercourses Brooks with a pumping station and sewer overflows makes flood risk particularly complicated, with the potential for deep flooding in certain areas. Part of the area is now designated a CDA. The SFRA vII (s3.5.3) indicates that investment is to be made in improving the pumping station/surface water drainage system. A similar situation exists at the confluence of the Padgate/Spittle Brooks, with a pumping station for the Cinnamon Brook operated by the Coal Board and overland flow pathways (see SFRA s3.5.4).

At Risley, Birchwood and Rixton with Glazebrook (far north east of Warrington Borough):

- River Mersey/Manchester Ship Canal to the south (no development next to this);
- Considered to be a relatively flood risk free area, relative to the rest of the Borough. Flood extents along the Glaze Brook being narrow. Glaze Brook as well as its tributaries, the Carr, Jibcroft, Holcroft and Hollins Green Brooks. Cockshot and Cross Brook in the west, draining to the Padgate Brook.

At Thelwall, Westy and Lymm:

- Manchester Ship Canal /River Mersey to the north (although no development is situated here);

- Various tributaries which drain to the Manchester Ship Canal. Limited areas of flood risk, mainly along the lower Thelwall Brook, upstream of the siphon under the Manchester Ship Canal. Limited areas of flood risk in general;
- Lymm Reservoir and Dam and the Bridgewater Canal.

At Stockton Heath, Appleton and Walton:

- Manchester Ship Canal /River Mersey to the north (land to the south of the Manchester Ship Canal rises up sharply);
- Various tributaries which drain to the Manchester Ship Canal. Limited areas of flood risk, mainly along the lower Thelwall Brook, upstream of the siphon under the Manchester Ship Canal. Limited areas of flood risk in general;
- The Lumb Brook is heavily culverted;
- Appleton reservoir and the Bridgewater Canal.

The Level 2 SFRA (s3.7.3) notes three locations where, due to climate change, the number of people and properties at risk of flooding will increase significantly. These are: Callands/Dallam (Sankey Brook between M62 and Sankey Valley Park), Longford (increased flow in and between the Longford/Padgate Brooks), and Howley/Latchford (increase in tidal flooding effecting more properties).

Halton SFRA

The level 2 SFRA is due to be finalised in early 2011 and assesses the level of flood risk from all flood sources (tidal, fluvial, groundwater, flood defences, sewers, canals, other artificial structures/systems (i.e. embankments, culverts and pumping stations)). Surface water flooding is assessed both by use of the Environment Agency's first and second generation surface water mapping, and by collating information on historic flood events/known drainage issues. Appendix E provides significant detail on SuDS suitability at the Council's development sites. Broadly, there are two categories of flood risk in the study area:

1) The Mersey Estuary coastal area (although the majority of the low-lying area is undeveloped saltmarsh); and

2) The individual smaller watercourses that distributed across the study area. The flood risks here are more complicated and varied than along the coastal area, and typically include issues such as constricted culverts/development some of which need to be pumped into canals or the tidal Mersey. With regards to fluvial flooding, the SFRA takes a catchment-by-catchment approach to identify the key issues in the catchments of each of these smaller watercourses.

The main watercourses 'Main Rivers' in terms of flood risk are:

South of the Mersey:

- Keckwick Brook: this drains the eastern portion of Halton northwards to Sandmoor. Flows are pumped into the Manchester Ship Canal, with excess flows being stored within the Oxmoor flood storage area.

North of the Mersey:

- Bowers Brook: this drains the eastern portion of Widnes, its catchment runs southwards parallel to the A557. The Brook is culverted under the St. Helens Canal, and drains to the Mersey across Widnes Warth. This presents a flood risk to the area of central and southern Widnes. The Level 2 SFRA has included extensive remodelling of this watercourse to more accurately define its extent;

- Stewards Brook: this drains central Widnes, its catchment runs southwards to the west of the B5419, and discharges to the tidal creek at Ditton Marsh;

- Ditton Brook: the majority of this catchment is located to the northwest, outside of the study area. The Ditton enters the study area adjacent to the A561/562/5300 junction, and drains the areas of Upton and Ditton in western Widnes, before discharging to a tidal creek at Ditton Marsh. This presents a flood risk to parts of Ditton; and

- Rams Brook: this drains a small part of the south-west part of the study area near Hale and part of neighbouring Speke. It discharges to a tidal creek across Hale Gate Marsh at Town Lane and presents flood risk to low-lying agricultural areas and access roads to Hale.

A number of Critical Ordinary Watercourses (COWs) have been identified in the study area. Despite being small, these watercourses present a considerable flood risk to adjacent development. COW watercourses in Halton are:

- Marsh Brook: this drains the area of Widnes between the Stewards Brook in the west and the Bower's Brook to the east. It is culverted along most of its length apart from a short section next to the Mersey at West Bank. It is classified as a COW due to its potential to flood the adjacent chemical works (floods when the channel is silted or there is a blockage from an outfall);

- Willow Brook: this is an open stretch of water in the centre of Runcorn and presents a flood risk to adjacent low lying properties. Frequent clearing of downstream of the culvert entrance is required; and

- Halton Brook: this presents a flood risk to the Astmoor Industrial Estate. Frequent maintenance is required to minimise the risk of flooding to industrial premises.

There are also several 'Ordinary Watercourses' in the study area, further details of which are presented in the SFRA.

Canals:

- St. Helens Canal: this presents limited flood risk. It runs along the northern edge of the tidal Mersey floodplain. Generally, adjacent development is located on higher land to the north of the canal;

- Manchester Ship Canal: presents limited flood risk. Water levels are heavily managed by control structures and the Manchester Ship Canal Company holds no records of flooding caused by the canal. In general the majority of adjacent development is situated on higher land above the canal's water level; and

- Bridgewater Canal: this is a contour canal with no locks. Water levels are controlled by sluices located in Manchester, and within Halton at Keckwick and Runcorn Old Town (drains to the Manchester Ship Canal). The sluice at Keckwick has limited capacity to assist managing water levels and can lead to flooding within the Keckwick catchment. The sluice in Runcorn is considered to be effective in controlling water levels, and its operation does not result in increased flood risk elsewhere.

More detailed summaries for all watercourses are provided in Section 2 of the Level 2 SFRA.

Map D012 in the Halton Level 2 SFRA indicates that the area with the most historical sewer flooding incidents is Runcorn and Weston/Weston Point. However, theses are also some of the most densely developed parts of Halton, otherwise historic events are otherwise spread over the whole study are with limited areas of concentration.

With regards to tidal flooding, the Level 2 SFRA considers that flood levels are generally contained within the banks of the Mersey estuary channel, even up to the 0.1 per cent AEP event. The Level 2 SFRA does not detail a "with sea-level rise" scenario, however, the Level 1 SFRA plotted Flood Zone 2 allowing for 0.96 m of sea level rise due to climate change over the next hundred years.

An assessment of rapid inundation areas has also been undertaken. A 'Rapid Inundation Area' is an area that could very rapidly flood with fast flowing/deep water. For example, when a river spills naturally onto its floodplain, water levels tend to increase slowly, with water levels creeping up and velocities remaining relatively low. However, if a flood defence protecting an area was to fail during a flood event, flood water would rapidly pour into the low-lying area. The rate of depth increase and velocities would be such as to endanger life and limit the ability for meaningful evacuation/preparation for flooding. The following areas in particular have been confirmed to be at risk:

- Hale Gate Marsh (lower Rams Brook);

- Parts of the lower Ditton and Stewards Brooks (i.e. within Widnes parts of Ditton, Hale Bank, Woodend, Lower House and Newtown); and

- The lower Keckwick Brook (Sandymoor).

All of these areas are potentially vulnerable to tidal flooding, or ponding of fluvial flood water. Areas 1 and 2 could flood directly from either source. Area 3 is partially protected from tidal flooding by the embankments of the Manchester Ship Canal. Figure D007 in the Level 2 SFRA indicates that with regards to fluvial flooding these areas are generally classified as "very low hazard", with the exception of the upper Ditton Brook which falls into the "Danger for some" and "Danger for most" categories. An assessment of canal breaching (SFRA Section, 4.3 Figures D021, 22 and 23) has indicated, that the residual risk of the Bridgewater Canal breaching poses significant risk to three areas: the Keckwick Brook, the valley through Norton Priory grounds to the MSC in Halton and the

Bridge Street area of lower Runcorn (all being classified as "Hazard to All". The Keckwick Brook flows directly into the Manchester Ship Canal and flap gates prevent backflow from the Canal into the Keckwick Brook when levels in the Canal are higher than those in the Keckwick Brook. When this occurs flow in the Keckwick Brook is diverted to the adjacent Chancellor Road pumping station (a United Utilities pumping station for surface water drains) and Oxmoor Flood Storage Area.

There are lengths of fluvial flood defences (embankments) along some of the watercourses (Rams, Ditton, Bowers and Keckwick Brooks), these are detailed further in Table 2-1 of the Level 2 SFRA and mapped on map D009. There are tidal frontages (low cliffs) along the northern edge of the Mersey estuary from Speke to Hale Gate Marsh. Beyond this there are saltmarshes and raised ground. The St. Helens Canal runs along the high tide mark. Along the southern edge of the Mersey, the Manchester Ship Canal forms much of the tidal frontage, with the exception of Wigg Island where an area of saltmarsh and raised ground (up to 15 mAOD) is present in front of the canal.

Groundwater is not considered to be a major issue currently, although there is the potential for groundwater rebound to occur due to the cessation of industrial abstractions.

Parts of the following sites are located in both Flood Zone 3b and Flood Zone 3a:

Employment adjacent to Ditton Brook and stewards Brook (s175, 176, 335, 253, 255 and 256), Sandymoor/Keckwick Brook: 22, 27, 252 and 873 as well as parts of the Hale Bank, Southern Widnes, Widnes Waterfront and Castlefields Action Areas.

Residential development (classified by PPS25 as 'more vulnerable') is not permissible in Flood Zone 3b, and the Exception Test would need to be satisfied for this development to occur in Flood Zone 3a. The Sequential Test would also need to be passed in the case of both proposed residential and employment development. However, if the areas of Flood Zone 3a and 3b are limited, development could be placed elsewhere within the sites and the flood risk areas set aside as open space (green corridors etc).

Parts of the following sites are located in Flood Zone 2:

Employment (s142) from the Stewards Brook, (s175, 176, 335, 253, 255 and 256) from the Ditton Brook, and s22, 27, 254 and 873 from the Keckwick Brook; as well as parts of the Hale Bank, Southern Widnes, Widnes Waterfront and Castlefields Action Areas.

For development in Flood Zone 2, the Sequential Test would also need to be passed in the case of both proposed residential and employment development. However, if the areas of Flood Zone 2 are limited, development could be placed elsewhere within the sites and the flood risk areas set aside as open space (green corridors etc).

SFRA Conclusions

Based on the Environment Agency's surface water flood mapping, 4 Critical Drainage Areas (CDAs) have been identified: Ditton/Hale Bank, Widnes, Keckwick and Runcorn (these are shown on SFRA Level 2 Figure D012).

The Halton Level 2 SFRA identifies the need for an outline Surface Water Management Plan (SWMP) to be produced for the borough, this should investigate strategic SuDS drainage options, the SWMP process will refine the areas broadly classified as CDAs.

St. Helens SFRA

A level 1 SFRA was produced in June 2009, and assessed the level of flood risk from most sources (fluvial, groundwater, flood defences, sewers, canals, other artificial structures/systems (i.e. culverted watercourses, pumping stations)). Surface water flooding is assessed to a lesser degree with the collation of some historic event information and presentation of areas with known drainage issues. Broadly, flood risk is mainly associated with the smaller watercourses distributed across the Council's area, especially those with compounding factors such as constriction by encroaching development or culverts.

The following watercourses are considered to be the key sources of fluvial flood risk in St. Helens:

- Carr Mill Dam – the SFRA has undertaken a breach/overtopping analysis of the dam to map the extent of the resulting rapid inundation flooding along the Black Brook downstream. This is a residual risk scenario (relatively unlikely), but has been undertaken to gain an understanding of the potential risk;
- Hardshaw and Windle Brooks – historical flooding associated with the constriction to flow caused by a 1.2m diameter water main on Rivington Road and also the potential for blockage of the Dilloway Street culvert screen;
- Windle/Mill Brook – historic flooding around confluence in Eccleston, prior to construction of flood defence for housing in the 1980s;
- Rainford Brook - flooding occurs on the Rainford Brook upstream of a culvert at Beech Gardens;
- Sankey Brook – through St. Helens;
- Sutton Brook – Gerards Lane upstream of Waterdale reservoir, commercial properties at Lea Green;
- Pendlebury Brook – historic events at the brickworks near Lea Green Road;
- Black Brook – West End Road, Blackbrook – flooding associated with culvert entrance downstream of the Black Brook/Clipsley Brook confluence, and remains of the St. Helens Canal upstream. Recent flood risk; and
- Lower Newton Brook - in Wargrave, from its confluence with the Sankey Brook to the Millingford Brook confluence.

United Utilities holds records of sewer flooding in Haydock, Sutton Leach, Rainhill and Rainford Village, however the DG5 database is only indicative of past events, and does not provide a reliable guide to areas of present and future risk. Surface water flooding issues are also noted in west Blackbrook, south of Stanley House Farm where there are multiple surface water outfalls, contributing to the risk of flooding from the Black Brook culvert to the

existing housing estate. St. Helens Council considers College Street, and Peasley Cross Lane to be the two key surface/foul water flood prone areas.

There is only limited information available on the St. Helens Canal which is maintained by the Council along infilled/cut off sections. The main section of note is the reach of the Black Brook north of the A58 Stanley Bank Way bypass and the culvert beneath Black Brook.

Groundwater is not considered to be a notable flood risk issue, and it is thought that any areas at minor risk will be mostly in the valley bottoms – i.e. within the fluvial floodplain.

The Following Flood Defence Structures are Present:

- Pendlebury Brook pumping station – to overcome mining subsidence, this pumping station pumps the river from a low point in the brook to a gravity flow section; Sankey Valley Park – pipe from the Sankey Brook to the St. Helens Canal to convey high flows. No Environment Agency operated raised formal defences[6]. Informal defences along the Pendlebury Brook, and at the Windle and Mill Brook confluence (SoP[7] of between 50 to 70 years). Raised informal defences in the Sankey Valley Park (SoP of ~100 years);

- Notable culverting on multiple watercourses in the Borough, in particular the Hardshaw Brook, but also the Pendlebury, Rainford and Sutton Mill Brooks;

- Opportunities identified to raise the SoP of existing maintained watercourses/defences at the following locations: Sutton Mill Brook (Peasley Cross); Pendlebury Brook (Sutton Manor); Windle Brook (Newton); and the Mill Brook (Denton Green, Eccleston);

- The SFRA notes the issues with constricted/encroached and culverted watercourses, the increased flood risk associated with culvert blockages being a legacy of this heavy engineering.

With regards to development allocations, a sequential assessment has been carried out as part of the SFRA. A key requirement for more detailed outlines of the Functional Floodplain (Flood Zone 3b) has been identified, in order to subdivide the areas of sites that fall within Flood Zone 3 into 3a and 3b. The majority of sites (35 of the 59 sites above 1ha) are found to be in Flood Zone 1, with another 12 in Flood Zone 2; however, the remaining 12 sites/parts of sites are located in Flood Zone 3, with one potential housing site known to be in Flood Zone 3b, and potentially some of the Economic Group 1 and 2 plus Major Develop Sites being in Flood Zone 3b. Section 6.1.2 of the St. Helens SFRA details the specific flood zone classification for sites. With regards to housing only one site is identified as being in Flood Zone 3b, with parts of another 4 potentially in Flood Zone 3b, for these sites the FRA

[6] A formal flood defence is a structure that was constructed, and is maintained as such (i.e. earth embankment, flood wall). An informal flood defence is a structure that has a secondary role as a flood defence – for example the wall of an old factory built adjacent to a watercourse may also act as a flood defence.

[7] SoP – Standard of Protection – i.e. the return period up to which the defence provides protection against flooding

will need to delineate the extent of each flood zone in more detail as well as justifying the sites via the Sequential and Exception Tests. With regards to Economic Group 1 Sites, only 1 site is in Flood Zone 3a, and potentially 3b, and Economic Group 2 Sites, 3 sites are in Flood Zone 3a, and potentially 3b. For Major Development Sites, 2 sites have been identified as being in Flood Zone 3a and potentially 3b. Twelve sites are identified as potentially becoming more at risk of flooding in future due to climate change, based on the assumption that the present extent of Flood Zone 2 provides a guide to the future extent of Flood Zone 3a.

Residential development (classified by PPS25 as 'more vulnerable') is not permissible in Flood Zone 3b, and the Exception Test would need to be satisfied for this development to occur in Flood Zone 3a. The Sequential Test would also need to be passed in the case of both proposed residential and employment development. However, if the areas of Flood Zone 3a and 3b are limited, development could be placed elsewhere within the sites and the flood risk areas set aside as open space (green corridors etc). For development in Flood Zone 2, the Sequential Test would also need to be passed in the case of both proposed residential and employment development. However, if the areas of Flood Zone 2 are limited, development could be placed elsewhere within the sites and the flood risk areas set aside as open space (green corridors etc).

SFRA summary of key areas most at risk of fluvial flooding:

- Centre - Park Street, Linkway East, Atlas Street, Linkway West, King Street, Duke Street, Kirkland Street and Lingholme Road;
- North - areas of Rainford adjacent to the Rainford Bypass;
- South - areas of Sutton Manor including Forest Road and Delamere Avenue;
- East - areas of Newton-le-Willows including Southworth Road, Mill Lane and Church Street; and
- West - areas of Eccleston and Dentons Green including Church Lane, Kiln Lane, Rivington Road and Alder Hey Road.

SFRA key areas most at risk from surface water flooding:

- College Street and the A570, Peasley Cross Lane, in the centre of St. Helens; and
- Centre of St. Helens (Ormskirk Street, Corporation Street, Cotham Street, College Street).

SFRA key areas most at risk from sewer flooding:

- Concentrated mainly on the upper reaches of Black, Rainford, Windle and Mill-Eccleston Brooks.

4.4.3 Catchment Flood Management Plans (CFMPs)

CFMPs take a strategic look at flood risk across the whole of each major river catchment in England. This approach allows a strategic framework for managing flood risk to be identified, such as improved land management to reduce run-off in the upper catchment, greater focus on managing the run-off from development in settlements upstream of flood risk areas and improvements to flood defences protecting settlements in the lower catchment. Areas where the planning system can be used to gradually reduce flood risk through improved flood risk protection/mitigations of new development are also identified.

For the strategic planning of new development in the Mid Mersey study area, the Councils should have regard for the CFMP policy aims for each catchment area. The aim should be to ensure that strategic development objectives align with the key options identified by the CFMP for managing and reducing flood risk.

Several Catchment Flood Management Plans (CFMPs) cover the study area. These include:

- Mersey Estuary;
- Weaver/Gowy;
- Small areas of western St. Helens are in the Alt/Crossens CFMP, and small areas in the north in the Douglas CFMP; and
- A small part of Warrington Borough is in the Upper Mersey CFMP area (the area southeast of Lymm).

Mersey Estuary CFMP

The Mersey Estuary CFMP identifies the Mersey Tributaries as the key sources of flood risk, i.e.: the Sankey and Ditton Brooks, as well as other similar watercourses. In particular flood risk is associated with culverted and encroached watercourses through the area. Tidal flood risk, and in some areas combined fluvial and tidal flood risk. Some areas of Warrington are identified as having a particularly high risk of surface water flooding. Prescot is noted as having an above average level of sewer flood risk. Groundwater flood risk appears to be low, despite the recent rebound of water levels in the major aquifer beneath the area, therefore flood risk from this source is considered to be lower than from other sources. Warrington, Padgate, Rainford, St. Helens, Widnes and Prescot are mentioned specifically as areas with large numbers of properties at risk of flooding. The CFMP notes that due to climate change, both Warrington and Great Sankey are both predicted to have large increases in properties at risk of fluvial flooding by 2100. Figure 4.9 shows the CFMP policy sub-areas.

Figure 4.9 Mersey Estuary CFMP Sub-Areas

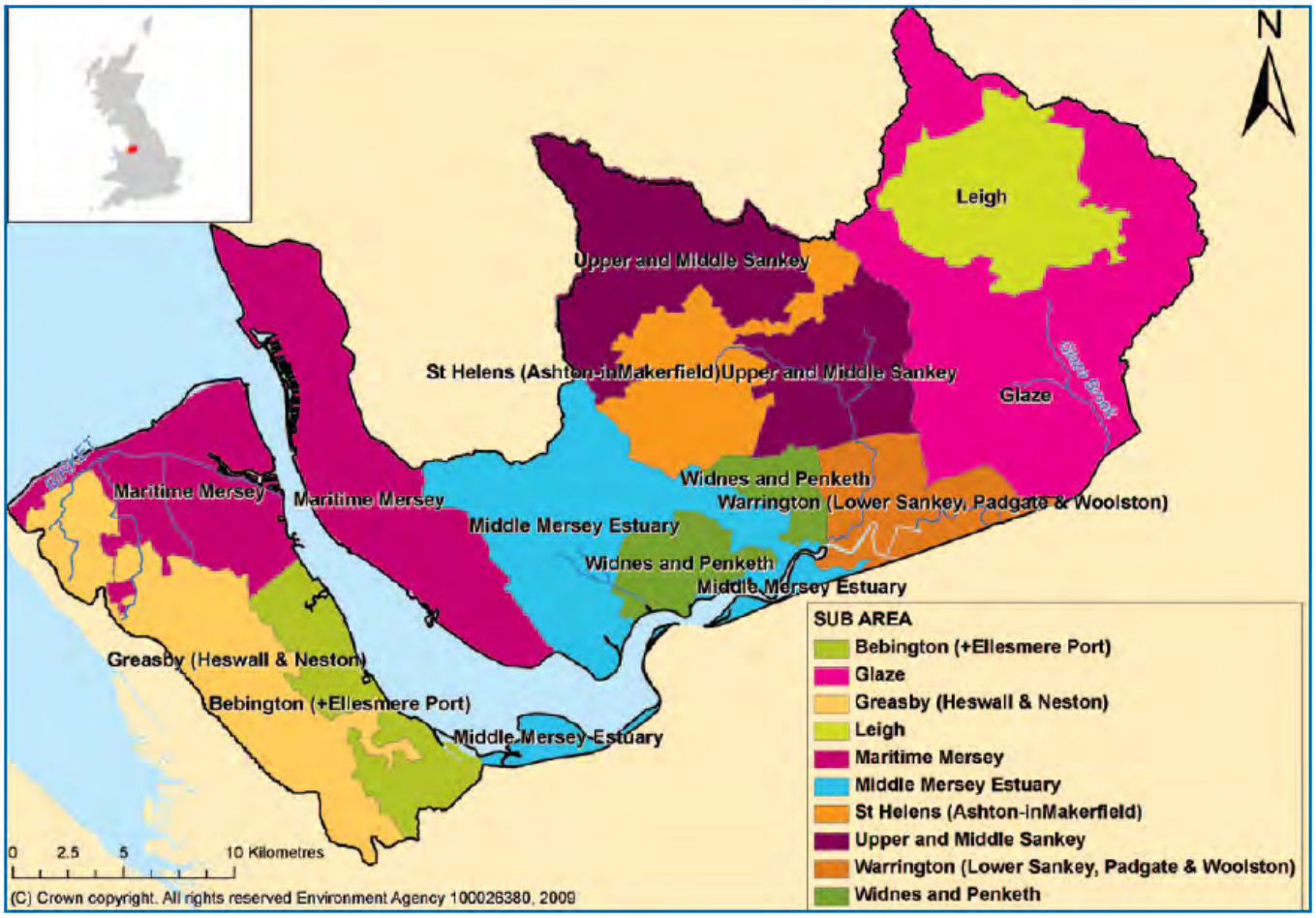


Table 4.8 details the relevant policies for each sub-area relevant to this WCS:

Table 4.8 Mersey Estuary CFMP Policies

Middle Mersey Estuary	Upper and Middle Sankey	St. Helens (and Ashton in Makerfield)	Glaze	Widnes and Penketh	Warrington (Lower Sankey, Padgate & Woolston)
Policy Option: 2	Policy Option: 6	Policy Option: 3	Policy Option: 2	Policy Option: 4	Policy Option: 5
Reduce FRM spending where possible. Future risk management through planning. Investigate options for reduced pumping/maintenance at Ince Banks. Flood resilience/resistance advice, reviewing current pumping station operations.	Creation of storage, management of run-off – SuDS and land management practices.	Maintain existing flood defence measures. Identify options for further measures to reduce flood risk. Use of suds/planning to manage flood risk.	More targeting of spending on key flood risk assets. Potential for storage enhanced. Flood risk management through better planning.	Monitor key risk areas. Assess feasibility of specific drainage schemes. UU to implement identified schemes. Asses key infrastructure at risk. Produce 'FRM for Warrington' study. SuDS. Stewards Brook hydraulic model. Flood resilience advice for properties in Penketh.	High level of flood risk, vulnerable to sea-level rise. Maintain MSC due to flood defence role. Consider additional embankments. Integrated drainage study for urban areas. Utilise SuDS. Manage risk via planning. Assess infrastructure at risk.
Policy Option 2: Areas of low to moderate flood risk where we can generally reduce existing flood risk management actions Policy Option 3: Areas of low to moderate flood risk where we are generally managing existing flood risk effectively Policy Option 4: Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change Policy Option 5: Areas of moderate to high flood risk where we can generally take further action to reduce flood risk Policy Option 6: Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits					

Table 2-3 of the Warrington Level 2 SFRA volume I provides further detail on the CFMP policies for Warrington. A specific sub-strategy, the *"Warrington Flood Risk Management Strategy"* has been prepared by the Environment Agency to further investigate flood risk in Warrington. This strategy includes the Sankey catchment as one of the flood risk cells, and focuses on measures that can be taken within the greater Warrington area to manage flood risk in key risk areas.

Weaver/Gowy CFMP

This CFMP primarily focuses on areas of these catchments that lie outside of the study area, with just the parts of Halton and Warrington Boroughs south of the River Mersey falling within the coverage of this CFMP. These areas largely drain northwards into the Manchester Ship Canal, and via water level control structures then into the Mersey Estuary. The upper reaches of the River Weaver's northern tributaries drain southwards along the southern edge of Halton/Warrington Boroughs. The CFMP notes the degree of tidal flood risk inherent in the areas coastal location, although this is mainly focused on more low-lying areas of the catchment (outside of the Mid Mersey WCS study area). No particular areas at risk from surface/sewer flooding are noted. An incidence of groundwater

flooding at Lymm golf course due to rising groundwater levels is noted. Warrington Borough, Stockton Heath and Thelwall have between 51 and 150 properties identified as being at risk of fluvial flooding. Halton, Ashville (River Weaver) and Sandymoor (Keckwick Brook) have also been identified with between 0 and 26 properties at risk. Due to its elevation/limited number of watercourses, only a slight increase in fluvial food risk is expected in Runcorn over the next 100 years.

Figure 4.10 Weaver/Gowy CFMP Sub-Areas

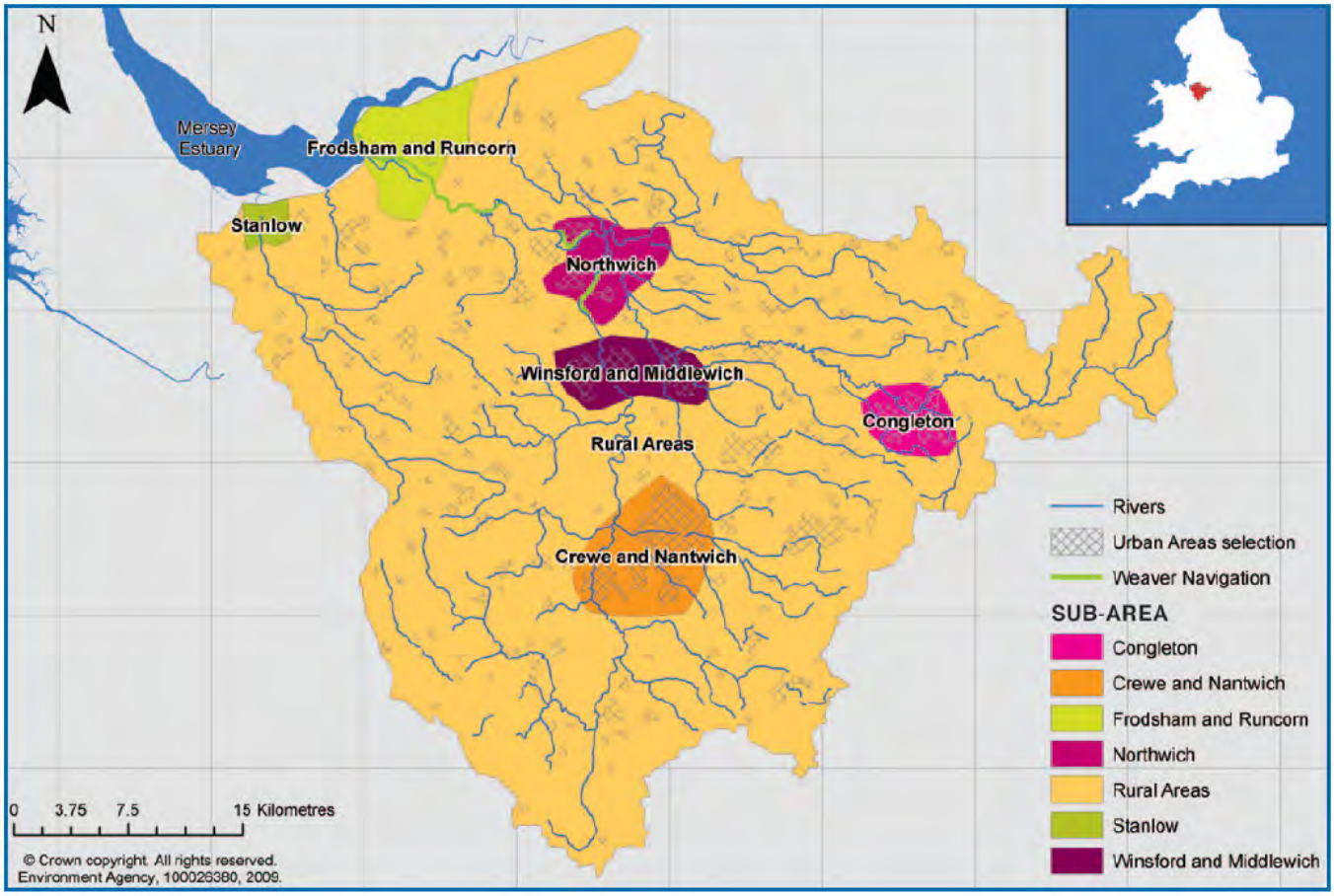


Table 4.9 details the relevant policies for each sub-area relevant to this WCS:

Table 4.9 Weaver/Gowy CFMP Policies

Runcorn (and Frodsham)	Rural Areas
Policy Option 4	Policy Option 6
Reduce flood risk via planning system. Catchment opportunities to reduce flood risk. Consider a range of FRM measures to maintain current level of flood risk into the future. Encourage flood resilience/resistance measures for properties at risk away from defences. Flood defence scheme for the Keckwick catchment. Investigate raising of earth embankments along the lower River Weaver.	Safeguard floodplain. Encourage better land management to reduce run-off and increase floodplain storage. Ensure rural watercourses are maintained for conveyance.
Policy Option 4: Areas of low, moderate or high flood risk where we are already managing the flood risk effectively but where we may need to take further actions to keep pace with climate change Policy Option 6: Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits	

Alt-Crossens, Douglas and Upper Mersey CFMPs

The small portions of the study area in these three CFMP areas fall into the category of Policy 6 – i.e.: *"Areas of low to moderate flood risk where we will take action with others to store water or manage run-off in locations that provide overall flood risk reduction or environmental benefits".*

Warrington Flood Risk Management Strategy (FRMS)

The Warrington FRMS *"Covers the whole of Warrington, from Winwick in the north to Appleton in the south and the outskirts of Lymm in the east to Fiddler's Ferry in the west. It covers the main centres of population including Westy, Latchford, Howley, Dallam, Orford, Sankey Bridges and Penketh".* The study focuses on the fluvial flood risk associated with the River Mersey, and the Sankey Brook, Dallam Brook, Longford Brook and North Park Brook, Spittle, Padgate, Whittle and Penketh Brooks. Historical flooding associated with the Sankey Brook and tributaries.

Figure 4.11 shows the flood cells for Warrington (the reference number here is used in the list below). Based on the supporting analysis, the identified improvements would result in a reduction of the number of properties with a risk of flooding greater than 0.5 percent Annual Exceedance Probability (AEP) to a third of the present levels. The strategy has resulted in a variety of options for each of the flood cells identified on page 13 of the FRMS document[8], these include:

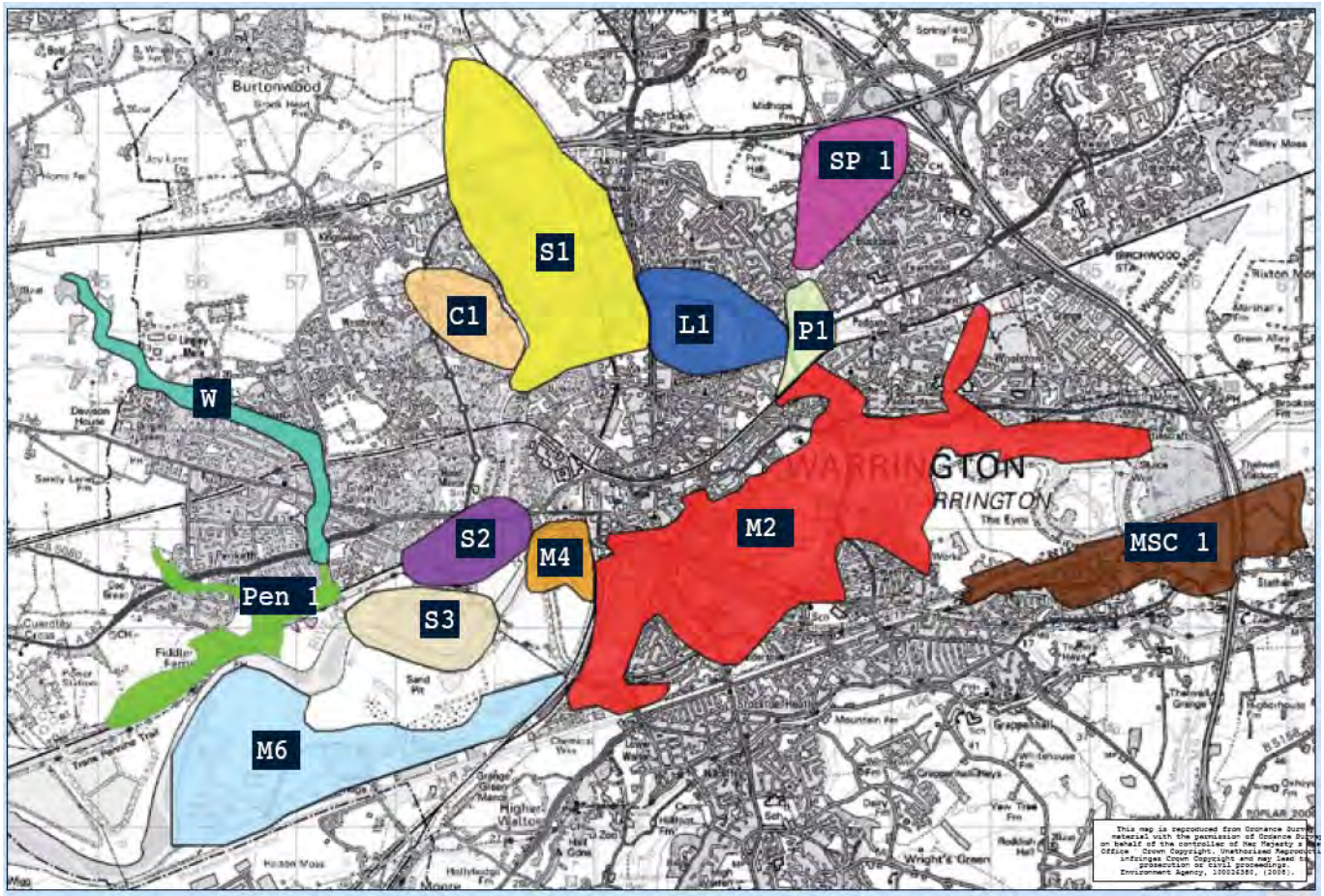
- Build walls and embankments (M2, S1, S2, Pen1);

[8] http://environment-agency.co.uk/static/documents/Leisure/Warrington-FRM-cons.pdf (accessed 19-11-10)

- Maintenance of existing defences, (M6, P1);
- Landowners to protect specific assets (M4, S3);
- Continue current flood risk management (cells W1 and C1);
- Review need for defences in 5 years (MSC1);
- Develop Proposals (SP1); and
- Rebuild a barrage and pumping station (L1).

However, the investment and construction program is dependent on the availability of funding; Flood Cell M2 is indicated as the key priority due to its highest flood risk ranking. Flood walls/embankments have been identified as a key means of protection in several areas since bypass channels or storage areas were not found to be feasible.

Figure 4.11 Warrington FRMS Flood Cells (from Warrington FRMS)



4.4.4 North West England Shoreline Management Plan (SMP)

Shoreline Management Plans detail the proposed future management of England's coastline, based on detailed technical investigations and consultations. The Mid Mersey study area is covered by the North West England and North Wales SMP, specifically the Mersey Estuary Sub-cell (cell 11a). The coastline is divided into "process units" which are sections of coast subject to the same physical processes and which are relatively independent from each other. The reaches of interest with respect to the coastline of Halton and Warrington are the following Process Units (PU): 7.3, 7.4, 7.5, 7.6, 7.7 and 7.8. Figure 4.12 illustrates these units and Table 4.10 summarises the proposed management schedule over the next century.

Three policies are identified for the process units within the study:

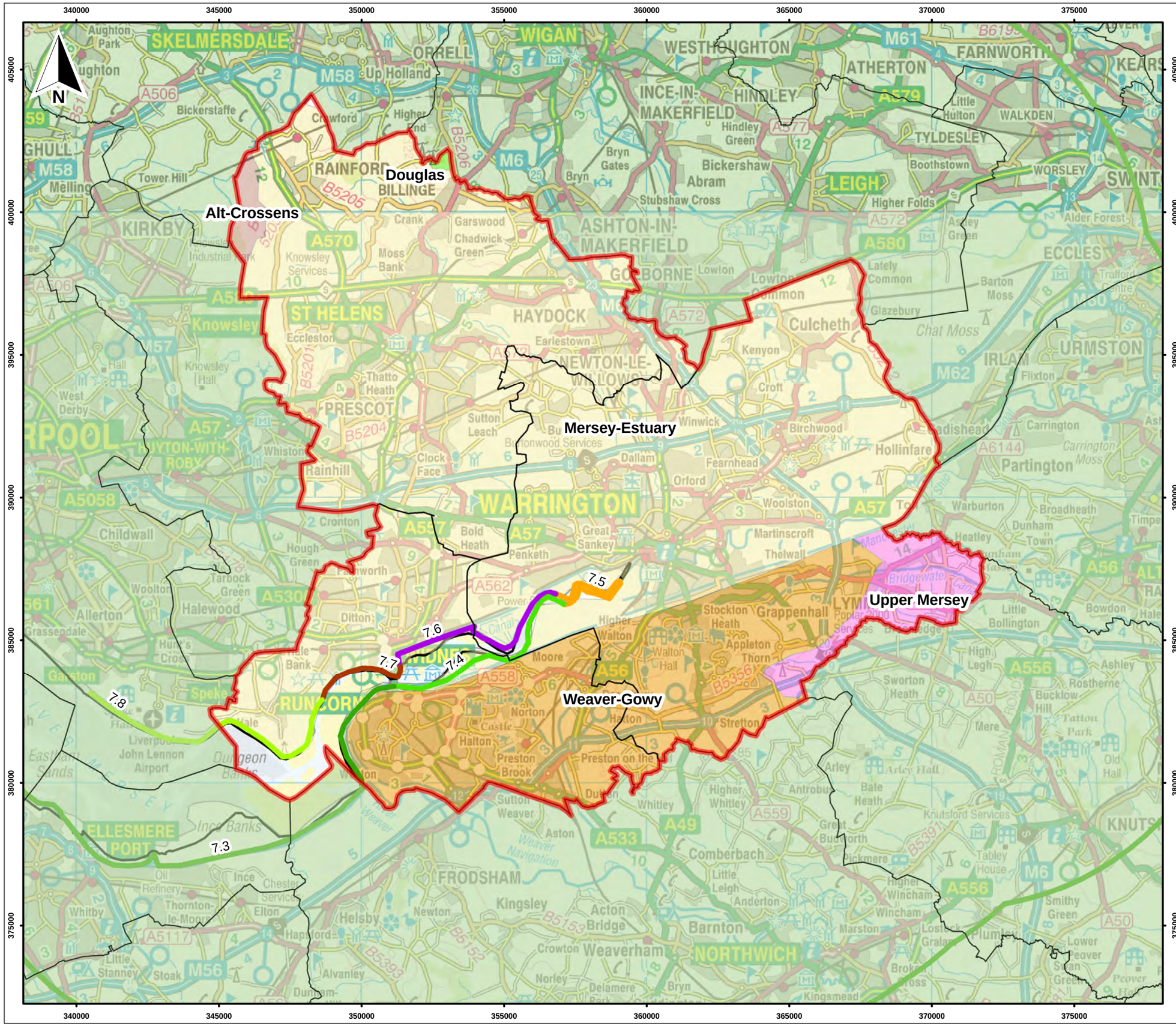
- Hold The Line – i.e.: manage flood/erosion risk by maintaining/upgrading defences;
- Managed Realignment – i.e.: pull back to the edge of the coastal zone, or to construct set back defences where feasible and maintain these new defences;
- No Active Intervention – i.e.: allow natural erosion/evolution of low cliffs.

It should be understood that the SMP is an adaptive document, and is based on our best current estimates of coastal erosion rates and sea-level rise. In addition, shifts in the low water channels within the Mersey Estuary could change erosion and deposition patterns. Also, further studies are needed to support these strategies, such as investigations into areas of historic landfill adjacent to the coastline. There is a need to manage and protect the strategic infrastructure in the area, such as the main existing urban areas, and also the Manchester Ship Canal (which also acts as a tidal flood defence in places). However, sediment supply to the estuary from sections of eroding coast has to be maintained in order to balance the supply of material for deposition elsewhere in the estuary. If the estuary bed does not aggrade as sea levels rise, then the resulting increase in depth could cause increased channel velocities and wave height which would increase the erosion risk.

For new development in the Mid Mersey study area adjacent to the coast, the SMP policy for that section of coastline should be checked. If the policy option identifies No Active Intervention, or Retreat the Line, there may be a need to reconsider the development's location, or to ensure that it is planned and designed to be resilient against flood and erosion risk over its planned lifetime.

Table 4.10 Shoreline Management Plan Mersey Sub-Cell – Halton and Warrington Process Units

Process Unit	Where	0 to 20 years	20 to 50 years	50 to 100 years
7.3	South Bank. Eastham Ferry (Ellesmere Port) to Runcorn Bridge	Hold The Line	Hold The Line	Hold The Line
7.4	South Bank. Runcorn Bridge to Arpley Landfill Site.	Hold The Line	Managed Realignment	Managed Realignment
7.5	South and North Bank. Arpley Landfill Site to SMP inland boundary at Warrington North STW, along north bank to west of Penketh	Hold The Line	Hold The Line	Hold The Line
7.6	North Bank. West of Penketh to Terrace Road (Widnes)	Hold The Line	Managed Realignment	Managed Realignment
7.7	North Bank. Terrace Road (Widnes) to Pickerings Pasture (Hale Bank)	Hold The Line	Hold The Line	Hold The Line
7.8	North Bank. Pickerings Pasture (Hale Bank) to Garston Industrial Est. (Liverpool)	No Active Intervention	No Active Intervention	No Active Intervention
Process Units 7.3, 7.4, 7.6, 7.7 and 7.8 are relevant to Halton. Process Units 7.4, 7.5 and 7.6 are relevant to Warrington.				



Key:

- Mid Mersey study area
- Local Authorities

Catchment Flood Management Plan areas:

- Alt-Crossens
- Douglas
- Mersey-Estuary
- Upper Mersey
- Weaver Gowy

Shoreline Management Plan Process Units:

- 7.3
- 7.4
- 7.5
- 7.6
- 7.7
- 7.8

0 1 2 4 6 8

Kilometers

Scale: 1:150,000 @ A3

H:\Projects\28467 Mid Mersey WCS\Drawings\GIS\

Mid Mersey Outline Water Cycle Study

Figure 4.12
Catchment Flood Managment Plan and Shoreline Management Plan

November 2010
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4.4.5 Development Site Assessment

Figure 4.8 shows the proportion of Flood Zone 3 in each of the wards within Halton, St. Helens and Warrington and indicates that tidal flood risk is concentrated along the River Mersey/Mersey Estuary and fluvial flood risk along the key tributaries. Areas of Warrington (Woolston, Orford and Penketh) as well as parts of Widnes are identified as key areas of risk. However, from the review of strategic flood risk investigations (SFRAs, CFMPs) it is understood that a large degree of flood risk in the study area is associated with artificial and modified drainage systems, i.e. culverted reaches of watercourses, and in certain areas piped drainage systems. This has been further exacerbated by historic development routing run-off directly into the drainage system without attenuation.

Sea-level rise will result in a larger area of coastal and low-lying sites being at risk of flooding, and in some areas the management policy of sections of the coastline will change in future. Therefore new development needs to be directed to areas where sustainable future management of flood risk is considered viable (either sites in lower flood risk areas, or sites where acceptable and sustainable flood risk mitigations are possible to manage flood risk).

The PPS25 Sequential and Exception Tests should be followed when promoting and progressing a development site, these tests provide a means of judging a site's acceptability in terms of fluvial and tidal flood risk against the proposed type of development. It will need to be accepted that the risk to some sites outweighs the benefits that might be delivered by their development. At other sites the mitigation of risks may be possible so that the site remains free from flood risk over its lifetime and flood risk is not increased elsewhere. Further, it is important that all sources of flood risk are assessed as part of the FRA process to ensure that all potential flood risks to the sites are appropriately assessed.

4.4.6 Potential Solutions

The conclusion is that significant growth in the study area may require sewerage capacity improvements but subject to detailed hydraulic modelling sewerage is not expected to represent a significant constraint. Long-term investment in sewerage infrastructure may be required to accommodate development in the key settlements (for example improvements to pumping stations in Warrington and Widnes). Some smaller-scale development may be accommodated, subject to hydraulic modelling.

All sites have an element of flood risk, although the probability of risk can be reduced, it cannot be removed completely. Where sewer flooding is a significant concern, potential actions will be discussed with United Utilities during either as part of any subsequent Detailed WCS, or on a detailed site-by-site basis (although it may be better to group sites that are affected by the same issue).

It is recommended that the Council works with United Utilities to identify the long-term investment required to support future development in the key settlements. Table 5.1 in the following 'Development and Infrastructure Action Plan' section sets out the specific solutions/actions that are required to support these key developments. United Utilities needs to know what developments are definitely planned and where in order to build the required

improvements into its Business Plan for investment in future AMP cycles. Our recommendations regarding a Detailed WCS are presented in Section 5.11.3.

Flood risk appears to be largely constrained in corridors along the main watercourses through the study area. Whilst the Mersey Estuary poses a major source of tidal and fluvial flood risk, the various tributary watercourses also pose considerable risk of fluvial flooding to some settlements across the study area. Numerous culverts and areas of encroaching development restrict the flow of water and ability of the natural floodplains to store flood water at various locations across the study area.

Flood risk is complex at locations where tributaries discharge to the Mersey through pumping or flap valves[9]. At these locations high-tides will reduce the ability for gravity drainage of these watercourses. Therefore sea level rise in the near future will increase the potential of flooding to low lying areas, both directly, and by reducing the ability of some watercourses to drain effectively. The Manchester Ship Canal provides a significant tidal flood defence function. Elsewhere along the estuary areas where significant new flood defence embankments and/or managed retreat are likely to occur have been identified. Proposals will need to be developed over the coming years to ensure that development located near the estuary in areas at risk of flooding or erosion remains sustainable.

Adopting a sequential approach to new development, in accordance with the requirements of PPS25 will ensure that new development is not placed in areas of unacceptable flood risk. Undertaking appropriate assessments, including considering the impacts of climate change, the influence of in-channel hydraulic structures on flood flows, and also other sources of flooding will ensure that development is safe from flood risk. By ensuring that FRAs in support of development are thorough and follow the Sequential and Exception Tests, flood risk betterment can be achieved (i.e. setting redevelopment on higher areas of sites, creating storage in the high-risk areas, removing culverts where possible).

In general, if assessed properly and mitigated, flood risk should not constrain development in the study area. The Warrington Flood Risk Management Strategy has identified potential options to alleviate flood risk in key areas of risk (flood cells), and new development should complement this by ensuring that surface water run-off is managed effectively. Where relevant, the opportunity may exist to 'pull back' development, and to reduce the level of culverting/encroachment of watercourses. In some cases it may be possible for new development to provide contributions towards new flood risk management infrastructure. Similarly, elsewhere in the catchment there are known key stretches of watercourse that present risks to development, notably the Keckwick Brook in Halton, and various reaches of the Sankey Brook and its tributaries.

[9] A flap valve allows river water out into the estuary, but prevents tidal water from flowing into the river. These are common features to allow the drainage of areas protected from flooding by flood defences. However, they can only operate when the tide is out, and river levels are higher than the tide level. When the tide is high, the water backs up and is stored in the river channel and adjacent low-lying areas. Pumping stations are provided where drainage is required at all times (i.e. if development is at risk)

4.5 Summary of Constraints

This Outline Water Cycle Study has confirmed:

- Water supply constraints: evidence within Section 4 shows that water resources and supply infrastructure is not a constraint to growth in the Mid Mersey area. However, in line with the principles of sustainable development and in the context of managing water resources in the longer term, it is recommended that all new homes are built to the Level 3/4 water consumption standard (105 l/h/d) of the Code for Sustainable Homes;

- Planned significant growth may require action to increase sewerage capacity in certain areas. Long-term investment in sewerage infrastructure may be required to accommodate development in the key settlements (for example improvements to pumping stations in Warrington). Detailed hydraulic modelling sewerage is required to determine the scale of improvements required. Some localised sewer upgrades are likely to be needed in St. Helens. However, sewerage capacity is not considered to be a significant constraint to growth across the whole of the study area;

- This study has identified that most of the growth will be in the catchment areas of Warrington North, Runcorn, St. Helens, and Widnes wastewater treatment works. United Utilities has indicated that it has capacity to meet the proposed growth within the next five years but after that it is less certain and demands and capacity will need to be modelled, particularly waste water treatment works which could potentially constrain growth after 2015. Planning WwTW for future growth now will ensure that this constraint is minimised;

- Due to the uncertainty at this time it is necessary to assume that all areas in which significant growth is planned could be constrained after 2015. The exact level of constraint cannot be known without modelling. However, St. Helens treatment works, and thus growth in the St. Helens area is identified as being most at risk of constraint. This is because environmental factors limit the options to increase capacity at St. Helens WwTW. The treatment works discharges into the Sankey Brook, rather than the River Mersey and so is subject to the constraints of the smaller fluvial system. This river is targeted under the WFD to reduce phosphate levels in order to improve the ecological status of the water body. In addition, most of the flow in the Sankey Brook comes from rain run-off rather than groundwater baseflow and so this watercourse could be at risk of reduced summer flows in the future due to climate change;

- There are areas that are at significant risk of flooding. If developments are identified as being within flood zone 3, then vulnerable uses should be avoided. Other uses that follow the sequential / exception testing will be accepted by the Council provided they satisfy criteria set out in PPS25. Comparison of potential development sites in the SHLAA data against the flood risk maps indicates that Central Warrington, north of the Manchester Ship Canal is a key area of potential risk.

5. Development and Infrastructure Action Plan

The purpose of this Development Action Plan is to help the Councils determine planning policies and other planning tools to ensure that development is able to take place in the short term whilst being sustainable in the longer term.

This section sets out actions to ensure that the preferred growth levels can be delivered sustainably. These take account of the pressures and constraints affecting the water environment based on discussions throughout the study. A timeline of actions is presented that encourages positive dialogue between the Councils, United Utilities, and the Environment Agency.

The development proposals as set out in Section 3 consist of a large number of potential growth sites across the Mid Mersey study area. In Warrington and St. Helens Council areas development is generally aimed at the main urbanised central districts. In Halton, the location of potential sites is more evenly distributed across the whole area. The Water Cycle Study has examined the factors that could constrain the location and timing of the 24,677 new dwellings proposed between 2010/11 and 2024/25. This information is intended to inform preparation of key planning policies. Further the information and recommendations should also be used by the Councils when preparing future housing and employment growth Strategies

5.1 Action Plan Considerations

During discussions with the Councils, Environment Agency, United Utilities, and other water companies previously a number of planning issues have been identified, for which specific actions have been proposed:

Council planning:

- Mid Mersey is a growth point (24,677 new dwellings, plus an undetermined level of employment growth by 2024/25). However, all three local authorities must be able to develop their LDF's reflecting their own local circumstances;
- Each local authority wants to understand if and how their share of the proposed housing and employment numbers (proposed employment figures not yet available) could be sustained;
- Whilst there may be options to re-evaluate potential development areas one of the core principles of the Growth Point Status is that there will be new housing opportunities close to areas of concentrated economic development. This is reflected in the proposed housing trajectories provided by the Councils.

Strategic development:

- Within the local authority SHLAA data there are strategic sites that have been confirmed (Section 3). Large strategic sites can take ten years or more to be completely developed;

- Large sites often consist of lots of mixed use and development activity can include remediation of contaminated brownfield land through to delivery of final housing numbers. Information in the Programme of Development indicates that the majority of key housing development sites are targeted on brownfield sites. This is relevant with regards to subsequent drainage requirements but also in terms of taking the opportunity to align remediation/drainage planning timescales with the asset planning and investment timescales followed by the water industry;

- There is a direct relationship between the number of houses and/or commercial properties built (and sold) on a strategic site and the amount of financial contribution that the developers are able to offer for additional sustainability measures. Developer contributions for sites are calculated on what infrastructure is required to make the development acceptable in planning terms. Therefore financial contributions will concentrate on essential infrastructure that needs to be provided by the developer;

- Phasing is integral to developers' plans. Generally, developers seek to begin house building in areas adjacent to existing infrastructure to allow time for additional new infrastructure to be incorporated within the strategic site;

- Strategic developers often assess the options to manage surface water run-off on the proposed development sites early in the planning stage.

Water Utilities:

- Under the Water Industry Act (1991) the water companies have a duty to provide public water supplies for domestic purposes, and to provide public sewer systems. However, they also have an obligation to manage customer bills by delivering a service that is cost-effective and good value for money. Ofwat is the economic regulator for the water and sewerage industry in England and Wales and the water companies are subject to asset planning controls. Water companies are willing to invest in infrastructure improvements once it is certain that investment is required. The timing of that investment is subject to the Asset Management Planning (AMP) cycles;

- When a developer wishes to proceed with a particular site, they can requisition the appropriate water company (or companies if separate for water and wastewater) to provide local network infrastructure in accordance with the relevant provisions of the Act (Section 98 for sewerage and Section 41 for water). The cost of this is shared between the developer and undertaker in accordance with provisions of legislation;

- Water sewerage undertakers expect that they will only be responsible for removing foul waste from new developed sites as the planning system requires surface water drainage to be managed using SuDS techniques;

- Detailed hydraulic modelling is required to demonstrate the specific infrastructure improvements that would be needed for a specific development. United Utilities has indicated that it does not anticipate any problems or constraints within the current AMP (2009/10 to 2014/15). Beyond this there is less

certainty. An issue arises when planners and developers require certainty regarding infrastructure provision before they can commit planning proposals. Conversely, water companies are reluctant to pay to model the requirements of particular sites unless they are confirmed. All parties require some level of certainty in order to move forward;

- It is highly recommended that the Councils continue to work closely with United Utilities to ensure that future developments within the proposed plan trajectories are included within United Utilities' asset management plans.

5.2 Principles of Sustainable Development

The action plan is designed to incorporate the principles of sustainable development in the UK as set out by Defra and the Sustainable Development Commission[10].

- Living within environmental limits;
- Achieving a sustainable economy;
- Ensuring a strong, healthy, and just society;
- Using sound science responsibly; and
- Good Governance.

The action plan will ensure that the Councils' Local Development Frameworks and Core Strategies deliver the first three principles, being based on the sound science/evidence base in this study, and forming part of the Councils' 'Good Governance'.

5.3 Action Plan to Deliver Proposed Development

The emerging Core Strategies for each of the local authorities will shape the spatial strategy for new development in the Mid Mersey area. This is reflected in the proposed housing distribution by Council ward as detailed in Appendix A. Section 5.3 considers the results from the wastewater and drainage constraints analysis, and presents the actions required to deliver the priority developments identified within each Council's preferred spatial strategy.

5.3.1 Actions

Section 4.3.1 has identified which wastewater treatment works will be affected by the proposed growth plans of each Council. Until 2014/15 the WCS must assume that United Utilities will be able to provide services for the

[10] http://www.defra.gov.uk/sustainable/government/what/principles.htm and http://www.sd-commission.org.uk/pages/our-principles.html

growth proposals as claimed by the company. Essentially this means that the levels of growth in Table 5.1 should not be constrained by wastewater services. Table 5.1 highlights those sites within these growth proposals that could require action to resolve identified problems.

Table 5.1 Immediate, Medium Term, and Longer Term Actions Required in Local Areas

Council Area	Supply Network Actions	Sewer/Drainage Actions
Halton: 3365 new dwellings by 2014/15 5192 between 2014/15 and 2019/20 2264 between 2020/21 and 2024/25	**Immediate:** Discuss with UU the need to better understand supply capacity in Runcorn town centre. Modelling may be needed and UU is unlikely to fund this without certainty that development will definitely take place. Negotiation may be required here. Liaise with UU to ensure the new main is planned for Widnes Waterfront. Ensure specific risks for sites 266, 853, 801, and 138 are investigated. **Medium term:** Liaise with UU to ensure capacity will be provided to support development at Runcorn Docks after 2015.	**Immediate:** The most immediate action in Halton is to address the sewer management issues along the Runcorn Waterfront. One site proposes 258 new dwellings between 2010 and 2015. This is not an environmental constraint but is an issue that needs to be resolved to ensure that sewerage services are in place and operational. **Medium term:** There are no immediate concerns regarding the capacity to pump wastewater from Daresbury but over 3000 new dwellings are proposed (495 between 2009/10 and 2014/15, 1773 between 2015/16 and 2019/20, and a further 1030 between 2020/21 and 2024/25). It is recommended that Halton Borough Council work with United Utilities to ensure that modelling work is undertaken in advance of the developments from 2015/16. **Longer term:** Sites in Central Widnes and all sites that will drain to Ditton pumping station could be constrained in the longer term until more significant investment is made to increase capacity at Ditton pumping station. For the purpose of this study this may affect sites proposed for development beyond 2015. In particular this could affect sites (in order of size of development): 267, 831, 255, 297, 112, 811, 109, 101, 108, and 492. Action is required to improve understanding of longer term capacity at Widnes WwTW and Runcorn WwTW.

Council Area	Supply Network Actions	Sewer/Drainage Actions
Warrington: 2073 new dwellings by 2014/15 1577 between 2014/15 and 2019/20 2199 between 2020/21 and 2024/25	**Immediate:** Ensure that UU is aware and prepared to deliver the supply mains reinforcements for the Omega development (12 to 18 months lead time to completion). Liaise with UU to ensure capacity for site 1506 (Peel Hall) is investigated. **Medium term:** The Arpley Meadows development will require a new main and this will need to be funded by the developer with a 3-4 year lead time. Commence discussions soon.	**Immediate:** Development at sites that are physically lower than the sewer network, such as site 1411 Former timber planing mill off Chester Road (160 new dwellings between 2010 and 2015, already under construction) and site 1451 Cantilever Gardens (14 new dwellings due in 2011/12) need pumping services installed to connect them. United Utilities is aware of the development sites and these requirements, and has been consulted during the planning process. It is advised that United Utilities consider whether the sewer upgrades at the far west of Warrington Borough in Great Sankey North will be sufficient to accommodate the potential build of 145 new dwellings between 2015 and 2020. The water company is unlikely to invest in any significant additional works until the need is confirmed but there may be opportunities to increase contingency in the sewer network during the 2011 upgrade. **Medium term:** Whittleford Avenue pumping station is not designed to accommodate the wastewater flows that will be generated by the new developments in the centre of Warrington. It is recommended that Warrington Borough Council raises the potential risk that this pumping station could pose to growth in the centre of Warrington. The two most significant development proposals that would drain through this area are sites 1643 (Bruche former Police Training Centre, 225 dwellings between 2015 and 2020), and 1092 Farrell Street South (285 dwellings proposed between 2015 and 2025). United Utilities is aware of these development sites, and that development at site 1092 will commence shortly. The proposed development at former police training centre could also be at risk from sewer flooding due to the cumulative impact of its development together with the development of Cardinal Newman High School which is also expected between 2015 and 2020. The action required here is to upgrade the Westy pumping station which is already at capacity. It is recommended that Warrington Council discusses this risk with United Utilities and to explore the options. Potential solutions include upgrading either Westy or Paddington pumping stations in AMP6 in line with the development timescale. Action required to improve understanding of longer term capacity at Warrington North WwTW (liaise with St. Helens Council) and Warrington South WwTW. **Longer term:** Further investigation required to confirm the capacity of the sewer network to accommodate flows from developments along the Manchester Ship Canal, and in particular the network serving potential developments at sites 1864 (Eagle Ottowa) and 1201 (New World).

Council Area	Supply Network Actions	Sewer/Drainage Actions
St. Helens: 4008 new dwellings by 2014/15 3317 between 2014/15 and 2019/20 682 between 2020/21 and 2024/25	**Immediate:** There is uncertainty and thus risk associated with the supply capacity in St Helens after 2015. Begin working with UU to develop a programme to undertake potentially widespread capacity assessments. This may require modelling. Work with UU to discuss the issues of proposed sites that are not close to the supply network (see Table 4.4)	**Immediate:** St. Helens is expected to experience the highest levels of growth in the Mid Mersey area between 2010 and 2015. Action is required between St. Helens Council, United Utilities, and the Environment Agency to begin discussing the potential constraint at St. Helens WwTW to increase capacity. Discussion needs to take into account forecast extra demand, the implications of the Water Framework Directive on phosphate levels in the Sankey Brook, and the potential impact of reduced summer flows due to climate change. Drainage and sewer limitations in this area make it critically important that new developments are designed to ensure that future foul and stormwater flows are kept separate. This means that sustainable drainage techniques are essential. It is recommended that the Council emphasises the importance of this as a planning requirement and that the Council works with developers to make sure that guidance is clear and drainage plans are robust. **Medium term:** Action required to confirm the capacity of the sewer network, particularly around Knowsley Road (site 284) as development is planned between 2010 and 2015, but with the bulk of new dwellings (147) proposed between 2015 and 2020. Action required to improve understanding of longer term capacity at Warrington North WwTW, particularly with regard to the large scale developments proposed at sites 14 (300 dwellings between 2015 and 2020 at the former Vulcan Works), site 332 (135 dwellings on the site of St. Aelred's school), and site 459 (150 dwellings on the Deacon Trading Estate). Liaise with Warrington Borough Council. **Longer term:** Ongoing dialogue with United Utilities and the Environment Agency. No specific actions in the longer term as most development in St. Helens is expected in the earlier stages of the planning period.

Halton Borough Council

Halton's Core Strategy Preferred Options Document outlines the Council's preferred spatial strategy. The preferred option is to locate development on a mix of brownfield sites and urban extensions with a large proportion of development within the defined urban areas of Runcorn and Widnes, and major regeneration of waterfront areas. In addition, this will be supported by a strategic site for housing and employment extending from the east of Runcorn. There will be limited development in rural areas. Key areas of change in Halton's emerging Core Strategy include:

- 3MG (Mersey Multimodal Gateway): increased facilities at this key regional logistics and distribution site;
- South Widnes: improvements to Widnes Town Centre, Widnes Waterfront through the rejuvenation of brownfield and redundant sites, and supporting regeneration in West Bank;
- East Runcorn: sustainable communities to be established at Sandymoor and Daresbury; and
- West Runcorn: housing growth at Runcorn Docks and employment growth at the Mersey Gateway (Weston) Port, and improvements to Runcorn Old Town Centre.

Halton is served by Widnes WwTW and Runcorn WwTW and there is expected to be capacity at these treatment works for the early stages of growth to 2015. After 2015 it is Runcorn WwTW that is forecast to take the brunt of development demands for wastewater services and so it is recommended that United Utilities begin to investigate identified capacity issues, in advance of the start of AMP 6 at which point a lack of capacity and delays potentially caused by lead times could be avoided.

St Helens Council

The overall spatial strategy for St. Helens is to regenerate the town by locating the majority of all new development close to the town centre (72 percent). Additional residential development will be provided in Newton-le-Willows and Earleston (20 percent) with the remainder at Haydock and Blackbrook (5 percent) and in rural areas (3 percent).

St. Helens' strategy expects development to be on brownfield sites. The main area for economic development is likely to be in the Southern Corridor in St Helens and Haydock Industrial Estate. Land on the former Parkside Colliery has been identified for a Strategic Rail Freight Interchange. The Council needs to ensure that all development proposals take into account the requirement to manage additional rainfall run-off appropriately for brownfield sites (see recommendations in Section 5.11.2).

Warrington Borough Council

The Core Strategy for Warrington is still being developed but it is expected to prioritise development on brownfield sites within inner Warrington. Areas where development would be promoted include:

- The town centre;
- Arpley Meadows/Bridgefoot (Warrington Waterfront); and
- Older parts of Warrington town.

The emerging Core Strategy also identifies areas where development would be reviewed and selectively promoted where required:

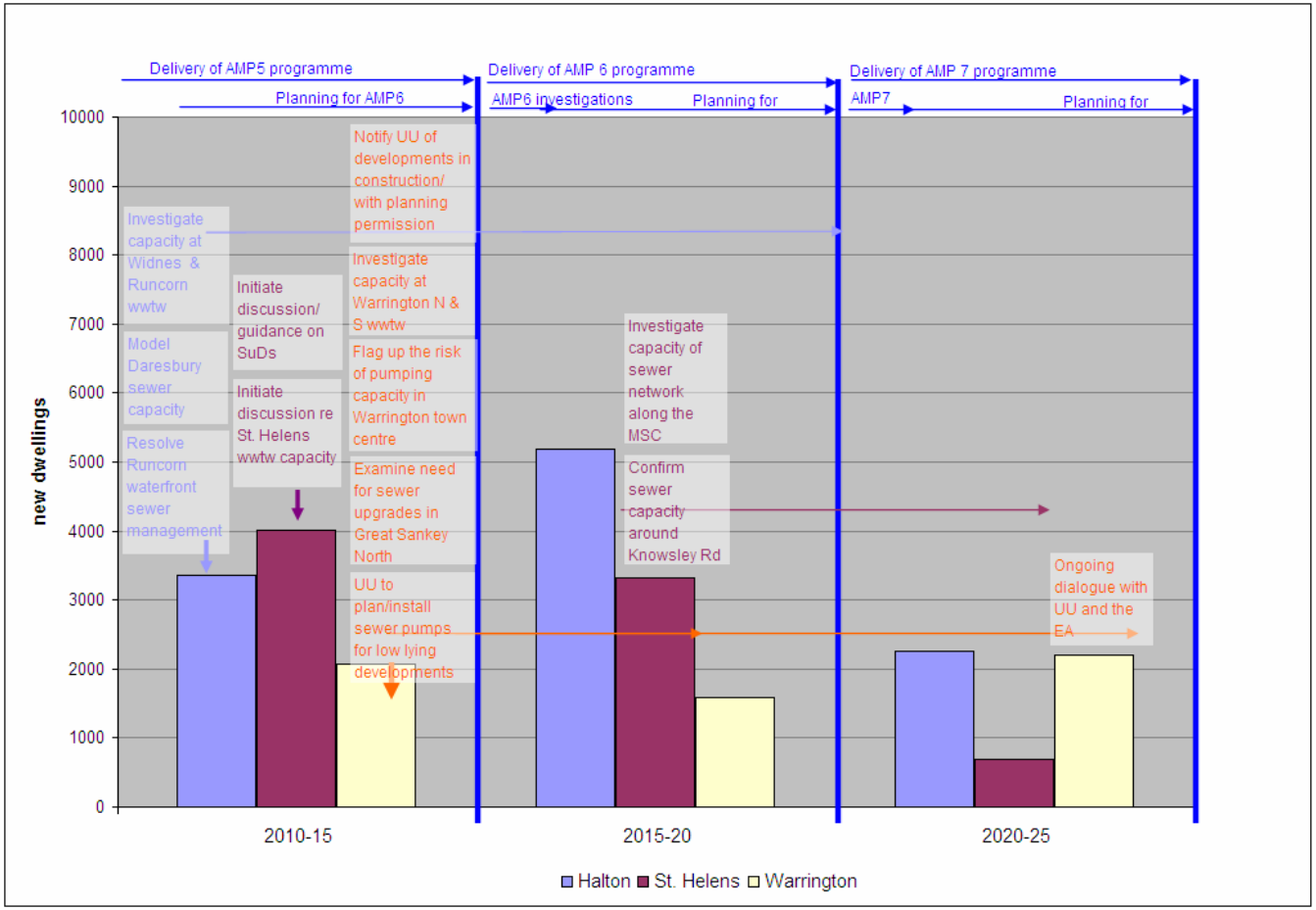
- Suburban areas of the town;
- Omega and the Homes and Communities Agency sites at Appleton Cross, Grappenhall Heys and Pewterspear; and
- The Omega site is also a key employment site which Warrington Borough Council is keen to progress.

Much of the housing growth in Warrington is proposed in inner Warrington. Warrington has been identified by the Councils as the key economic development area for the Mid Mersey Housing Market, and it is an objective to locate housing close to the employment areas to mitigate and reduce the impact of commuting. The drainage assessment has identified that the main pumping station that pumps sewerage from Warrington into and through the sewer network towards the treatment works was not designed to accommodate the proposed levels of growth. Therefore, it is recommended that Warrington Borough Council raises to United Utilities the potential risk that this pumping station could pose to growth in the centre of Warrington. This information would help United Utilities develop its Business Plan, identifying critical investment needs within its operating area. At this stage it is not appropriate to recommend a detailed water cycle study for this specific area as this may be a constraint that can be resolved through the existing water company planning process.

5.4 Timeline of Actions

Figure 5.1 illustrates the annual growth rate per Council area under the preferred scenario that has been provided. It annotates the high level growth rates with the actions that are required to ensure that this can be delivered and delivered sustainably. The actions include a combination of actions on the part of the Councils, for example initiating discussion with the infrastructure providers and regulators to begin tackling some of the issues that could constrain growth in the future. There are also actions on the part of United Utilities such as including development figures in their plans for AMP6 and commencing infrastructure upgrades in the immediate future.

Figure 5.1 Mid Mersey Growth Projections and Timescales of Actions of Partners



5.5 Actions Leading to Sustainable Development

The proposed actions in the timeline are generally focused on the Councils and environmental partners continuing to discuss development plans and agreeing priority work areas. There needs to be regular dialogue on the potential need for additional wastewater treatment and sewer drainage upgrades post 2015. It is important that the Councils support United Utilities in preparing its 2014 Business Plan by maintaining dialogue and providing useful and timely planning information.

Increased capacity in terms of the volume of water that can be treated as well as the level of treatment required inevitably results in additional power costs and carbon impact. United Utilities has estimated that by 2015 its investment programme is likely to increase its carbon dioxide emissions (CO_2e) overall by 27,000 tonnes. United Utilities has developed a carbon reduction programme with the potential to reduce emissions by some 48,000 tonnes, more than offsetting the increase. This will be a reversal of the steady and substantial increase in emissions over the past 20 years, which has seen the Company's total emissions double[11].

United Utilities states that the main elements of this programme come from extracting more of the energy available in sewage sludge. The Company also intends to expand its combined heat and power plants at wastewater treatment sites. Other significant contributions are due to come from hydroelectric equipment built into the water assets and by improving pump efficiency.

The WCS action plan identifies that treatment and sewage upgrades are likely at intervals after 2015. It also highlights when planning/investigative work will be needed in advance of capacity being reached. The staggered nature of this should provide United Utilities with sufficient lead times to deliver services to meet both housing need and environmental objectives, at reasonable cost.

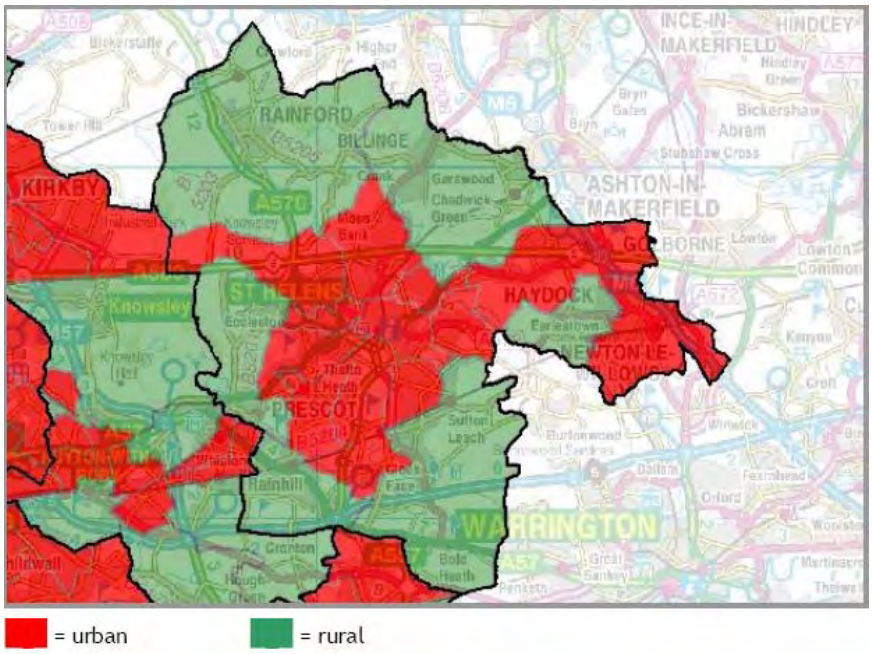
Phosphates have also been identified as a problem in the water courses in the study area (e.g. in the Sankey Brook). In its Business Plan, United Utilities has stated that it is due to begin work at some of its major sites to meet the requirements of the Water Framework Directive, installing phosphate removal equipment and meeting tighter ammonia and biological oxygen demand standards. However, there are technical and financial limitations on how much phosphate can be removed through sewage treatment. There may be opportunities that the Councils could use to reduce phosphate in the environment. The main opportunities lie in reducing run-off from agriculture. This may be particularly relevant to St. Helens Council whose growth is most likely to be constrained by water quality. Information in the "Economic Strategy for Rural Merseyside"[12] (St. Helens, December 2009) shows that there are rural areas in the upper catchment of the Sankey Brook, i.e. around Rainford and Billinge. The report also states

[11] United Utilities. Business Plan 2010–2015 Planning for the future.

[12] http://economicdevelopment.sthelens.gov.uk/SITEMAN/publications/22/MerseysideREAP-LocalAuthoritySummary-St_Helens.pdf

that north of the urban core, much of the agricultural land is of high quality and the majority of farmland is arable cultivation.

Figure 5.2 Rural and Urban Areas of St. Helens



(Source: Economic Strategy for Rural Merseyside)

St. Helens Council may have a role in working with partners to encourage sustainable land management practices to benefit the water environment, and with a view to mitigating against the potential constraint on the principle water treatment works. Prevention of such substances entering the sewerage system, and therefore addressing the original source of pollution, is likely to be a more cost-effective and sustainable approach." This supports the Environment Agency's position as set out in the North West River Basin Management Plan that a partnership approach is required to achieve the objectives of the Water Framework Directive.

5.6 Funding Considerations

Delivering the necessary supporting water and sewerage infrastructure is critical to facilitating the envisaged residential and commercial growth of Mid Mersey. Communities require access to water, drainage, flood defences and green infrastructure. The Barker Review[13] concluded that shortcomings in the delivery and funding of water

[13] The Barker Review of Housing Supply: http://www.barkerreview.org.uk/

infrastructure and services have real potential to delay housing growth. For example, it claims that this has delayed the delivery of around 40,000 dwellings in the South East of England.

Whilst the specific cost of the required water and sewerage infrastructure are investigated in detail by the water companies, the funding mechanisms and their policy implications that need to be considered further by the Councils and are outlined below.

5.7 Water Industry Funding

5.7.1 Legislation

United Utilities is appointed as the water and sewerage undertaker for the Mid Mersey area through an appointment made under the Water Industry Act 1991. The principal duties of a water and sewerage undertaker are set out in that legislation. Section 37 of that Act places a duty upon a water undertaker to develop and maintain an efficient and economical system of water supply within its area. Similarly Section 94 places a duty upon a sewerage undertaker to provide, improve and extend a system of public sewers to ensure that its area is effectually drained and the contents of those sewers effectually dealt with.

5.7.2 The Regulatory Process

The Water Services Regulation Authority (Ofwat) is the economic regulator of water and sewerage companies in England and Wales.

For every five year asset management planning (AMP) cycle, companies submit a business plan to Ofwat. The plans set out each company's view of what it needs to do to maintain its assets, maintain or improve service to customers and deal with its impact on the environment. The funding is linked to the setting of customer bills (known as the Price Review process).

Any infrastructure requirements which arise after agreement of the five year AMP will normally be considered for the following AMP period. AMP5 will cover the period 2010 to 2015. Water companies are able to submit interim determinations within the five-year planning cycle to seek additional funding for unforeseen requirements, but most plans should be covered by the normal submission process. A WCS covers a longer planning period and can therefore inform longer term water company asset planning.

5.7.3 United Utilities Investment Plan

United Utilities is committed to maintaining and improving its sewage networks and wastewater treatment services, and the Company has set out its investment plans in its 2009 business plan. The plan is based on the Company’s understanding of proposed regional development, requirements to meet environmental objectives, and its obligation to limit increases on customer bills.

In the 2009 Business Plan United Utilities proposed to invest £1.3 billion in its wastewater business over the period 2010 to 2015. The key elements of this investment include:

- Actions to reduce storm overflows (i.e. combined sewer flows spilling into watercourses during heavy rainfall events. These are also known as unsatisfactory intermittent discharges);
- Dealing with existing hydraulic inadequacies in the sewerage system that lead to sewer flooding;
- Increasing the capacity of seven wastewater treatment works to meet demand from new development (works not specified in the published plan);
- Improvements to ensure that effluent quality from wastewater treatment works is improved to meet the requirements of the Water Framework Directive.

5.8 Alternative Sources of Funding

5.8.1 Developer Contributions

Under Section 106 of the Water Industry Act developers have a right to connect to the existing sewerage system. The developer is required to fund the connection to the sewer and the cost of any on-site sewerage. Should the developer need to cross third-party land in order to connect to the existing sewerage system, then they can requisition the sewerage undertaker to provide a new sewer under Section 98 of the WIA. Requisitions are funded by the developer but the cost is discounted to take account of income received from new sewerage charges over a 12-year period. As with sewage treatment, any capacity improvements to the sewage network are funded through customers' sewerage bills as part of the five-year business planning cycle agreed with the water regulator (Ofwat).

United Utilities has stated that it requires developer contributions for water supply and wastewater connections. The amount of contribution from developers is linked to the number of houses (or buildings) that they are going to develop. For local infrastructure serving more than one development site, it is necessary to share costs equitably between developers. Any infrastructure requirements which arise after agreement of the five year AMP will normally be considered for the following AMP.

In the case of a dispute Ofwat has a process for handling disputes and appeals regarding the requisitioning of water mains and public sewers[14];

[14] http://www.ofwat.gov.uk/consumerissues/selflay/gud_pro_disappmainsewer.pdf

5.8.2 Planning Obligations/Section 106

Planning obligations are typically undertakings by developers or agreements negotiated between a local planning authority and a developer in the context of granting planning permission. These are underpinned legally by section 106 of the Town and Country Planning Act 1990, and are also known as section 106 agreements. Government policy is that, in the context of planning permission, planning obligations should be used to make development acceptable in planning terms. This could be by securing contributions towards the provision of infrastructure and facilities required by local and national planning policies.

The scope of such agreements is laid out in the Government's Circular 05/2005. S106 agreements have recently been scaled back to their original intention and, specifically, to provide a mechanism that supports the infrastructure necessary to mitigate any harmful impact resulting from a development, therefore making a development acceptable in planning terms. Matters agreed as part of a S106 must be:

- Necessary to make the proposed development acceptable in planning terms;
- Directly related to the proposed development; and
- Fairly and reasonably related in scale and kind to the proposed development.

5.8.3 Community Infrastructure Levy

It is the purpose of the planning obligations to secure the requirements that are necessary for specific developments to gain planning permission. Community infrastructure levy (CIL) contributions are required for more general infrastructure improvements.

The CIL is a new local levy that authorities can choose to introduce to help fund infrastructure in their area. The CIL regulations came into force in April 2010 and give local authorities the ability to charge developers to help fund new infrastructure provision. An update in November 2010 sets out the Coalition Government's changes to the CIL[15].

CIL enables local authorities to apply a levy to all new developments (residential and commercial) in their area, subject to a low de minimis threshold. Where appropriate the local planning authority could use a CIL to supplement a negotiated agreement, which may be required for site specific matters, including affordable housing.

The CIL should be based on a costed assessment of the infrastructure requirements arising specifically out of the development considered by the development plan for the area, taking account of land values and potential uplifts. Standard charges would be set, which may vary from area to area and according to the nature of development proposed.

[15] CLG (November 2010). The Community Infrastructure Levy: An overview

The CIL would break the restrictive link in the existing planning regime where a contribution must be directly related to a particular development. However, the Government states that CIL should not be used to remedy pre-existing deficiencies in infrastructure provision, unless these have been, or will in time be, aggravated by new development.

If the levy raised on particular sites is too large (given all the different infrastructure requirements) there is a risk that it could make development of those sites unviable, and therefore preventing some land from coming forward for development. For example, the value uplift when planning permission is granted may be smaller on certain brownfield sites, in particular those that require substantial remediation.

CIL payments could be collected for the delivery of water infrastructure and for maintenance arrangements of SuDs for example, however, if the Council seeks to use CIL for collecting contributions, analysis of all infrastructure requirements and costs will be required to ensure that an appropriate level of contributions is sought.

The Government will introduce changes to the Community Infrastructure Levy Regulations to free up payment arrangements. Local authorities will be able to decide their own levy payment deadlines and whether to offer the option of paying by installments.

Further information on the Community Infrastructure Levy Regulations is available online[16]. The Planning Advisory Service (PAS) currently has useful information online about the CIL[17]. The future of PAS is uncertain but it is expected that an advisory service will continue in some form.

5.9 Planning Risks

There are significant risks when planning for large-scale growth. The capacity assessments are based on assumptions of occupancy rate and per capita consumption of water. The Councils are striving for sustainable development. As part of this the Councils have a responsibility to communicate up to date development plans with United Utilities. If actual housing growth turns out to greater than planned then the water company could potentially be put in a situation where it has to provide piecemeal supply solutions, which are likely to be less 'sustainable' than an optimal solution based on accurate development plans. Conversely, there is a risk to United Utilities if actual growth (and therefore demand for water) is less than planned for as this could result in the Company making unnecessary investments, or have a negative impact on customer service. Water companies develop their plans based on forecasts using growth assumptions. The uncertainty, and therefore the level of risk, increases towards the end of the planning forecasts.

[16] http://www.legislation.gov.uk/uksi/2010/948/contents/made

[17] http://www.pas.gov.uk/pas/core/page.do?pageId=122677

The Councils can help to mitigate against the likelihood of these risks occurring by maintaining dialogue with United Utilities, and the workshops undertaken as part of the WCS have proven a useful step in this process. Information on existing population and changes in occupancy rate will help United Utilities to revise its forecasts and thus re-assess the need and timing of new schemes/asset improvements. Successful demand management is critical to sustainable growth and the Councils can help to ensure that demands are suppressed to the levels forecast by United Utilities by including rigorous demand management conditions in the planning system, for example sustainability policies including water efficiency, and supplementary planning documents setting out targets and providing guidance relevant to the Code for Sustainable Homes and BREEAM sustainability assessments.

5.10 Technical Requirements in Planning Applications

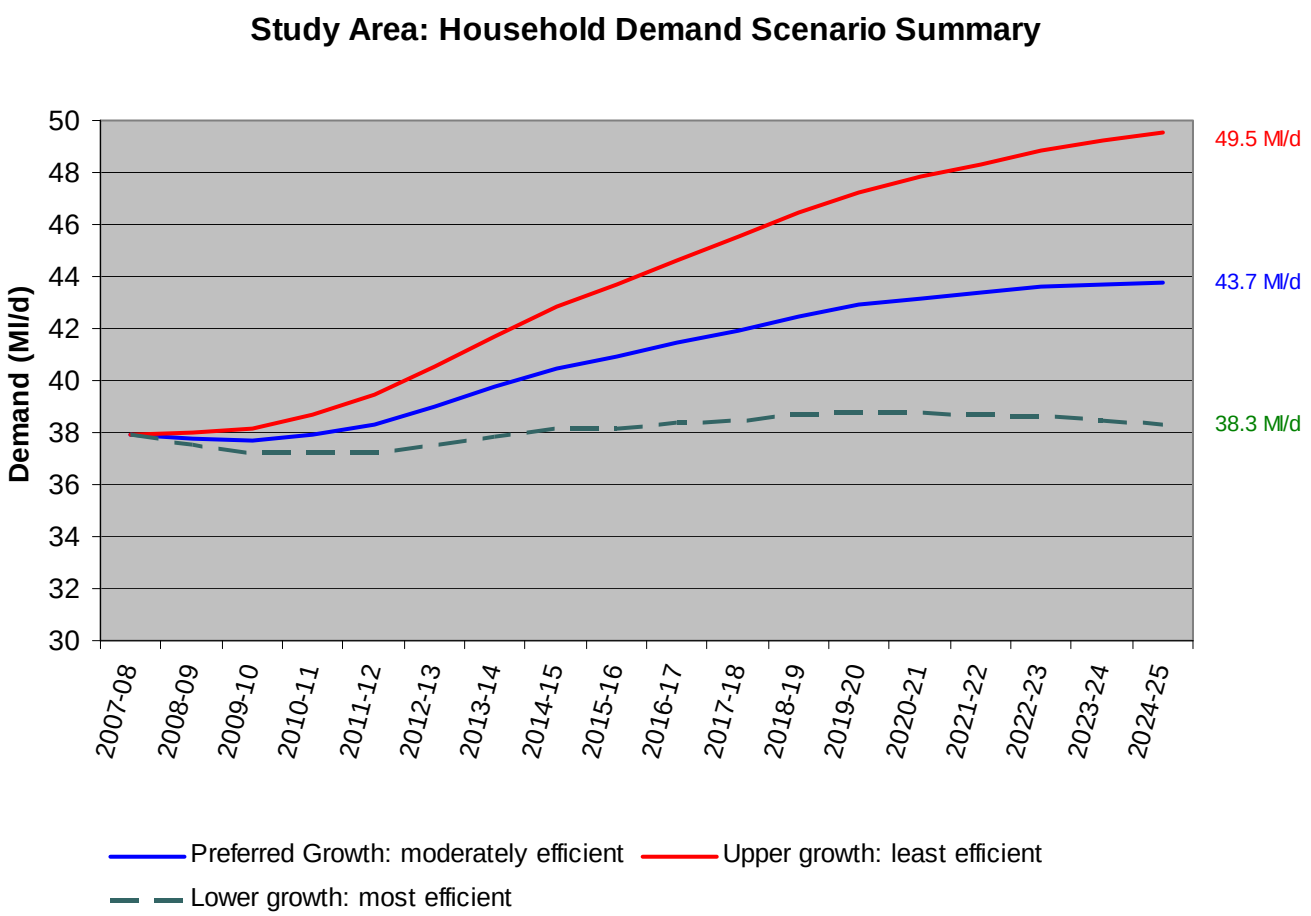
Section 5.3.1 above sets out the key actions needed to ensure that required infrastructure is delivered. However, there are other sustainability measures that should be incorporated within the Core Strategies. This section sets out the water efficiency measures and sustainable drainage techniques that should be required and demonstrated within developer planning applications. It also reconfirms the flood risk principles that should be considered when assessing planning applications.

5.10.1 Water Efficiency

The constraints assessment demonstrates that whilst water resources in the North West are under increasing pressure, United Utilities has access to sufficient supplies to meet demand for the next ten years, taking into consideration growth across the whole region. United Utilities recognises that demand management will be an important part of its strategy to maintain secure supplies in the long term. It is recommended that the Councils adopt policies in line with other areas across the country to instil a culture of sustainable development, including measures such as the requirements of the Code for Sustainable Homes to ensure new homes are built to support efforts to reduce unnecessary levels of water consumption of the people living in them.

Entec has assessed the potential combined impacts of water efficiency and growth scenarios across the study area. The water company projections of per capita consumption for existing and new households have been applied to the study area to approximate the potential change in demand for water across the area. An upper and lower range has then been calculated by applying minimal water efficiency in a 20 percent higher growth rate scenario, and maximal efficiency in a 20 percent lower growth scenario.

Figure 5.3 Potential Range of Water Consumption Levels Over Time in the Mid Mersey Area



The results show that demand from households is currently approximately 38 Ml/d. There is limited information on existing demands from non households. The alternative growth and water efficiency scenarios suggest that by 2024/25 demand from households (existing and new) could be between 38 Ml/d (no net gain above existing levels) and 50 Ml/d.

The blue line represents demand that could be expected if housing growth and consumption levels are in line with the forecasts in United Utilities' WRMP. The analysis is based on United Utilities' WRMP which begins at 2006/07 which is why the scenarios do not converge at 2010/11. More detailed information on the water efficiency scenarios is available in Appendix C.

United Utilities has installed water meters in all new properties since 1989. Monitoring water consumption is critical to understand how water is being used and so how to manage it effectively. Many analyses of water consumption in measured and unmeasured households across England and Wales have been completed by water companies and other researchers and the results clearly demonstrate that measured customers use less water than

their unmeasured counterparts. The level of saving is generally equivalent to the volume of water that is commonly used unnecessarily (wasted) in unmeasured homes (i.e. leaving taps running, opting for lower flush toilets or installing retrofit efficiency devices etc). Metering technology is developing, and there are now Smart meters which enable customers to monitor their consumption more closely and to understand better how they use water. United Utilities does not currently install Smart meters as standard, however trials of the technology are currently ongoing. In its WRMP the company does confirm that during 2010-15, "we will be investigating new tariffs, alongside use of new meter reading technology. This may result in the implementation of new tariffs by 2015 that could encourage further demand reduction".

It is recommended that the Councils liaise with United Utilities to understand their metering aspirations, in particular the types of meter that the Company is considering, as there may be opportunities for the Councils to work with developers to ensure that building design supports the metering technology. As presented in Section 4.2.2 United Utilities' long term plan to secure water supplies is dominated by schemes to access more water resources. Customer side management is forecast to contribute much less to balancing supply and demand. It is therefore recommended that the Councils include water efficiency requirements in their planning conditions and look for opportunities to make more use of emerging metering technologies in new build properties to encourage more sustainable use of water by the occupants.

5.10.2 Sustainable Drainage Recommendations

The Environment Agency[18] provides guidance to developers in terms of managing the environmental issues affecting a potential site, including an environmental checklist identifying requirements within the following areas:

- Managing the risk of flooding;
- Managing surface water;
- Using water wisely;
- Wildlife and green space;
- Preventing pollution;
- Managing waste;
- Land affected by contamination;
- Sustainable construction; and

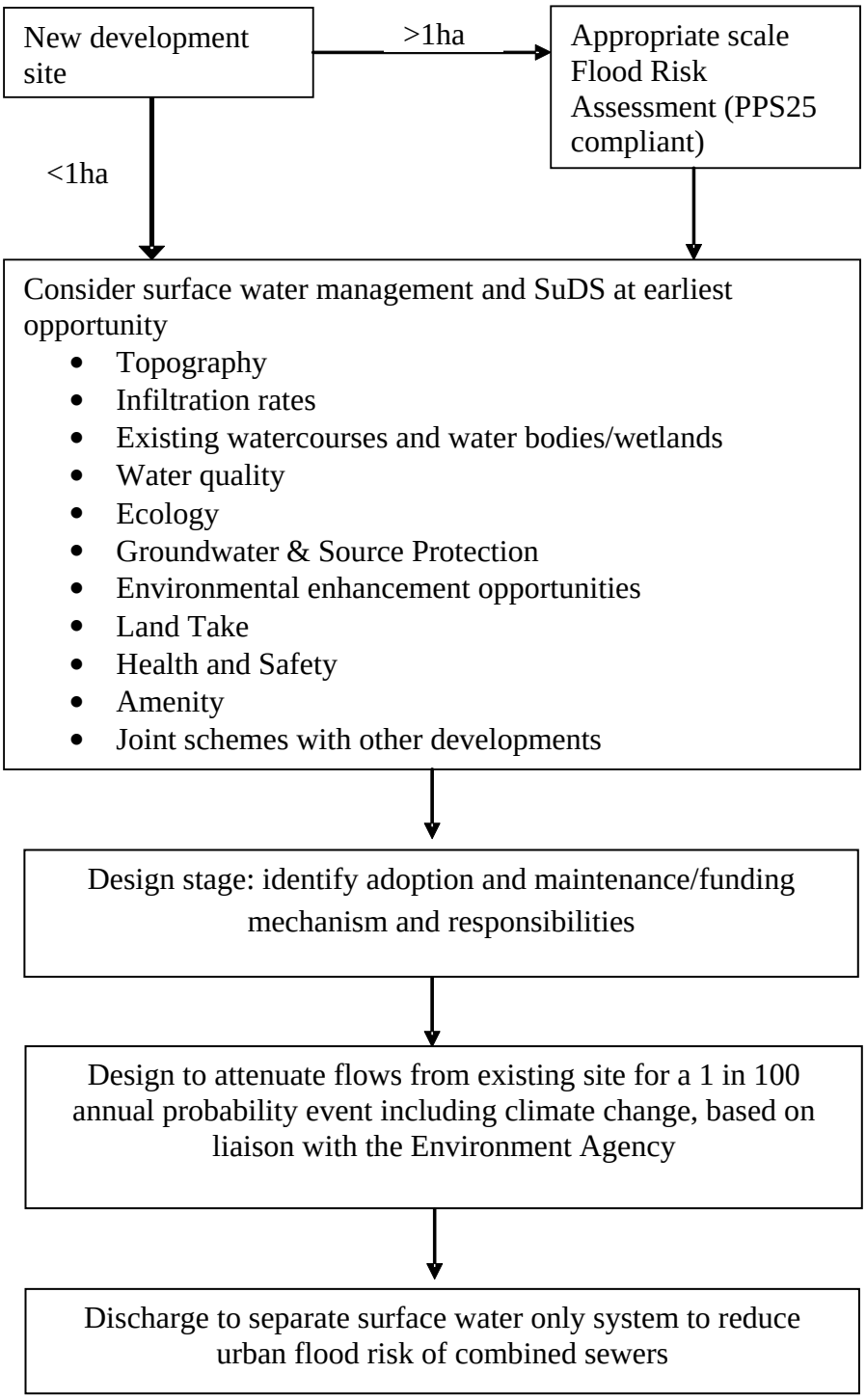
[18] http://www.environment-agency.gov.uk/developers

- Recreation, society and health.

A copy of this checklist is provided in Appendix F.

Developers should be encouraged to consider the land take required for SuDS at the earliest opportunity, as some SuDS need a greater footprint than traditional piped drainage systems. As mentioned above, all new developments greater than 1 hectare, or within Flood Zone 2 or 3 should be accompanied by a Flood Risk Assessment to consider the site's drainage strategy and feasibility of SuDS. A drainage strategy flow diagram is presented in Figure 5.4. This refers to surface water drainage, which should be kept separate from foul drainage to reduce pressures on the sewerage capacity in the study area.

Figure 5.4 Drainage Strategy



Sustainable Drainage Systems

The key issue to the effectual drainage of new development is the sustainable management of surface water. In areas with combined sewer systems, the diversion of surface water to SuDS (infiltration, attenuation and potentially discharge to a surface water sewer or watercourse) can reduce pressure on foul/combined sewers and potentially create spare capacity to accommodate the additional foul flows generated from new development.

In order to minimise flooding resulting from heavy rainfall and drainage constraints, development plans must consider the potential run-off and discharge rates from potential development sites, as well as consulting with the sewerage undertaker to determine existing capacity of the drainage network. PPS25 states that all developments greater than one hectare must provide a Flood Risk Assessment which considers surface water management for the development to prevent increased flood risk from surface drainage.

PPS25, Environment Agency, and good practice guidance (i.e. CIRIA guidance[19]) promote the use of Sustainable Drainage Systems (SuDS). SuDS are designed to reduce the potential impact of new and existing developments with respect to surface water drainage discharges by making more use of natural processes to convey surface water away from development. They aim to:

- Control run-off at source;
- Improve water quality by treating run-off and removing pollutants prior to discharge off site;
- Enhance the amenity value of a development;
- Encourage groundwater recharge; and
- Integrate with the environmental surroundings.

SuDS are the name given to a drainage approach, rather than any particular drainage type, and are often described in terms of a "management train", a series of progressively larger scale practices to manage run-off and control water quality. The management train is:

- **Prevention**, Application at individual sites, e.g. use of rainwater harvesting, management to prevent accumulation of pollutants;
- **Source Control**, Control of run-off at or very near to its source e.g. through permeable pavements, green roofs etc;
- **Site Control**, Management of water in a local area or site e.g. by routing water from building roofs and car parks to large soakaways or infiltration/detention basins;

[19] http://www.ciria.org.uk/suds/publications.htm

- **Regional Control**, Management of run-off from a site or number of sites, typically in a balancing pond or wetland.

Where possible, run-off should be managed at source by infiltration (before options such as discharge to a watercourse or surface water sewer are considered). Infiltration based SuDS can be designed to effectively manage the pollutant load in run-off, an important issue in development areas overlying aquifers used for water supply. A common example is to route roof water/run-off from lightly used areas to infiltration features, and run-off from potentially more contaminated areas (loading bays) to the local drainage system. In most cases any pollutant particles are absorbed and dissipated by vegetation, although in some cases infiltration may not be considered viable due to the pollution risk, and other SuDS measures should be used. Infiltration SuDS are best suited to areas overlain by permeable soils, drift and geology. Examples of these drainage techniques are permeable paving, soakaways, infiltration trenches, infiltration basins and swales.

The suitability of the soil/geology across the study area for infiltration varies considerably. This is mainly due to areas of mudstone geology and superficial alluvial deposits, peat and also till (glacial clay). However, large areas are underlain by sandstones with superficial deposits of sand and gravel. Figure 5.5 provides a guide to areas likely to be suited to infiltration techniques: High suitability, Moderate suitability, and Low suitability. However, conditions vary over short spatial scales, and only a site-based infiltration test will confirm the actual level of infiltration possible at a site. Even where infiltration is not possible as the main management route for surface water, it may be able to play apart in the overall surface water management strategy for a site.

Across the majority of the study area, the potential for infiltration is limited by superficial deposits of glacial clay. However, large areas with soil/geology more conducive to infiltration are also present. Areas and settlements that are more likely to be suitable for infiltration SuDS techniques are listed in Table 5.2.Due to the variability of soils and geology, however, site-specific infiltration tests should be carried out to confirm the feasibility of infiltration drainage.

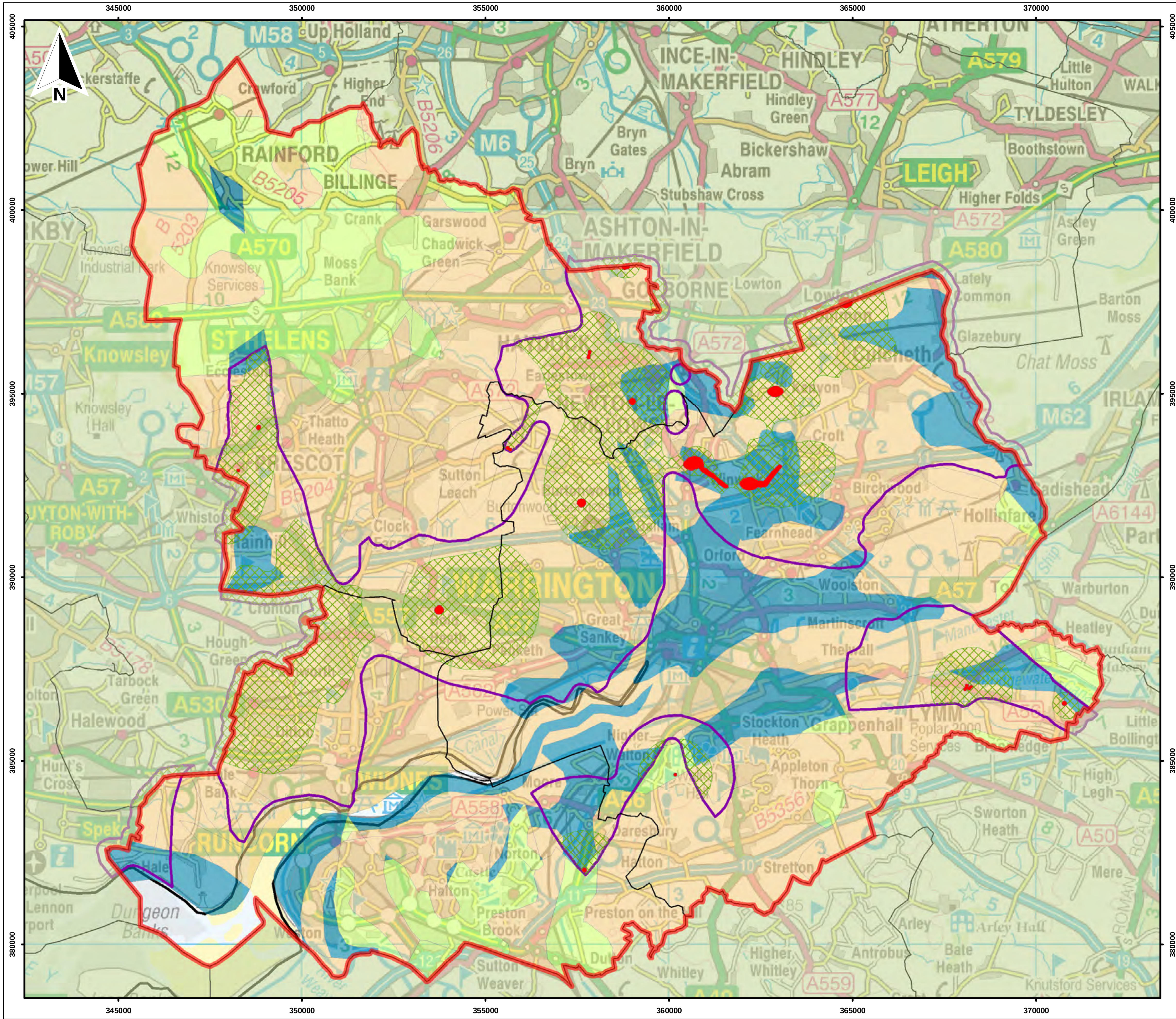
Table 5.2 Areas Potentially Suitable for Infiltration SuDS Techniques

St Helens	Warrington	Halton
Rainford	Parts of Warrington – mainly to the east of the town. Parts of Dallam and Sankey.	Parts of Runcorn
Northern St. Helens	Winwick	Parts of Halton
Parts of Rainhill and Newton-le–Willows	Higher Walton, Stockton heath and parts of Grappenhall	Moore, Norton, parts of Preston Brook and Preston on the Hill,
	Parts of Lymm and Appleton Thorn	
	The Warrington Level 2 SFRA provides further details on SuDS viability within Warrington.	Section 6 of the Halton Level 2 SFRA provides further details of SuDS viability in Halton

Assessment based on review of soils, drift geology, bedrock geology and groundwater vulnerability maps

Where infiltration is into an aquifer, the risk of contamination should be assessed and minimised, particularly where the groundwater is a source of public water supply. Several Source Protection Zones (SPZs), exist within the study area (see Figure 5.5) and therefore additional measures/investigation will be required in these areas. The Environment Agency and United Utilities should be contacted to confirm whether infiltration is the preferred method in these areas.

The SuDS approach is not wholly dependent on infiltration, but also includes attenuation techniques such as ponds, wetlands, green roofs and water recycling schemes which hold back run-off volumes and rates and allow water reuse. Attenuation features, such as ponds, can be free of water under dry weather flow conditions or be permanently wet and designed to hold more water when it rains. Attenuation features store the surface water run-off from a site, and release it slowly after a rainfall event to a surface watercourse or surface water sewer. In addition, the management of surface water via SuDS and discharge in this way will reduce surface water discharges to combined sewer systems. This will assist United Utilities in progressively reducing the surface water drainage pressure on their combined sewer systems. Therefore, it is recommended that in any attenuation SuDS should aim to discharge into a surface water body.



Key:

Mid Mersey study area

Neighbouring local authorities

Indicative suitability for infiltation SuDS

High suitability

Moderate suitability

Low suitability

Source protection zones

1

2

3

The main WCS document, and also each Local Authority's Strategic Flood Risk Assessment (SFRA) provides further information on SuDS suitability across their areas.

0 0.5 1 2 3 4 5

Kilometers

Scale: 1:100,000 @ A3

H:\Projects\28467 Mid Mersey WCS\Drawings\GIS\

Mid Mersey Outline Water Cycle Study

Figure 5.5
SuDS and source protection areas

February 2011
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5.11 Recommended Actions

5.11.1 Water Efficiency Policy

RECOMMENDATION 1: The Core Strategy should contain overarching policies for sustainable development, and it is recommended that this includes reference to water efficient new homes and non-household buildings. However, it is not essential to include specific targets in policies and the Supplementary Planning Documents (SPDs) can be used to provide the extra guidance and water consumption targets as per the Code for Sustainable Homes and BREEAM standards. Provided that the policies are based on robust evidence, as provided within this WCS, this is a more effective method of driving through sustainability measures.

The SPDs may advise that homes meet level 3 of the Code for Sustainable Homes for water, as a minimum. A recent study completed by Entec UK Ltd for the London Development Agency has demonstrated that basic water efficiency measures (6/4 litre dual flush toilets, standard rather than power showers, restrained flow bathroom taps etc) are feasible in terms of performance and customer satisfaction, and are sufficient to enable all types of new households to reach Level 3/4 of the Code for Sustainable Homes.

RECOMMENDATION 2: BREEAM standards exist for different building types, from industrial and commercial to buildings used for office, retail or education. It is recommended that for non-household development, the Councils' SPDs include a mandatory assessment by a BREEAM assessor for non-household developments, with the expectation that the developments meet the Good standard, as a minimum, with regard to the water consumption targets for the development type.

The Waste and Resources Action Programme (WRAP), sponsored by Defra, has recently developed and consulted on a draft procurement tool aimed at embedding water efficiency in construction contracts and procurement documents. The output is a draft guide and model clauses to help construction clients and contractors specify water-efficient practice when procuring design, construction and facilities management services in commercial buildings[20]. It is recommended that the Councils review the final outputs to be aware of the latest guidance on water efficiency in procurement and non-household developments, to potentially inform future policy.

Local Authorities have an important role supporting the efforts of the water companies to raise awareness of the need to use water wisely, and for helping to distribute information to customers explaining how they can use water more efficiently and what the benefits are to them. The Environment Agency has highlighted that the planning authorities have a key role in managing water resources via spatial plans that contain policies promoting the efficient use of water resources.

[20] http://www.wrap.org.uk/construction/tools_and_guidance/water_efficient_proc.html

It is recommended that in addition to policies for water efficiency in new buildings, the Councils promote awareness in local communities of the need to save water. The Councils may choose to lead by example by employing policies to minimise the unnecessary use of resources in its own buildings, vehicles and in all its activities.

5.11.2 Sustainable Drainage and Flood Risk Policy

The main sources of erosion and flood risk in the study area have been identified as coastal (i.e. defences and tidal flooding), and along tributaries (legacy of historic culverting and development encroaching on watercourses/floodplain). Level 1 SFRAs have been prepared for all three Councils, and Level 2 SFRAs are in preparation for both Halton and Warrington.

RECOMMENDATION 1: It is recommended that a Flood Risk Management Strategy and/or Level 2 SFRA are prepared for St. Helens, similar to that prepared for Warrington/Halton. This will aid the more detailed assessment of flood risk from key stretches of watercourses in the area. Significant housing growth is proposed for the study area but flooding incidents must be identified and the risks understood with a view to being resolved. Depending on the result of those investigations Surface Water Management Plans may be appropriate to support plans for development in existing urban areas at risk (i.e. central St. Helens). As set out in PPS25 the Councils are obliged to pursue the sequential approach to avoid new development in areas of flood risk.

RECOMMENDATION 2: The Catchment Flood Management Plans have been developed by the Environment Agency and serve to help prioritise flood management actions at a catchment level, rather than constrained within administrative boundaries. The Councils should take account of the CFMPs, particularly in upstream areas of the catchment to identify drainage and/or land use policies that will benefit areas downstream. However, the Mid Mersey Local Authority Areas are in the lower parts of the wider Mersey Estuary catchment (Figure 4.9) and Weaver/Gowy catchment (Figure 4.10). It is recommended that the Councils liaise with their neighbouring (upstream) Council counterparts to ensure that drainage/land use practice policies in those areas take account of the flood risks that have been identified in Warrington, St. Helens, and Halton. Future planning decisions will have to be based on knowledge of what is being done upstream and how that will affect flood risk in their own areas.

RECOMMENDATION 3: The Floods and Water Management Act will see greater emphasis placed on the use of SuDs within new developments. Any SuDs policy within the Core Strategies will need to reflect this forthcoming legislation. The WCS recommends that the Core Strategies includes policies that promote sustainable drainage techniques (SuDS) that mimic natural drainage, rather than using traditional piped systems in all new developments. This could include wetland areas and ponds, where these are feasible.

Existing Core Strategy policies on Green Infrastructure may also provide the impetus for this. This is particularly relevant as another requirement of the Growth Point was to develop a Green Infrastructure strategy in tandem with the WCS. Wetlands will create green corridors in urban areas, providing benefits to flood alleviation, amenity, recreation and water quality. Land management techniques should be applied and encouraged where possible in rural areas to alleviate flooding. Examples include wetland creation and afforestation.

RECOMMENDATION 4: The WCS recommends that the Councils provide a limit on run-off from new developments to reduce the risk of surface water flooding. As a minimum this should require no increase in discharge as a result of the development. It is recommended that steps are taken to ensure surface water run-off from brownfield sites is reduced; a typical reduction being 30 per cent from existing rates to contribute towards reducing flood risk. Alternatively, a more restrictive requirement in areas considered to be Critical Drainage Areas, would be to restrict all sites, brownfield and Greenfield, to Greenfield rates.

Increases in rainfall intensity due to climate change should also be included in the estimation of the SuDS attenuation/infiltration required. Surface water from greenfield sites should be dealt with by sustainable measures (not discharged to public sewer) unless this is proven as the last resort.

Alternatively, a more restrictive requirement would be to restrict discharge at all sites to greenfield rates regardless of whether it is a brownfield or greenfield site. This may be appropriate in areas considered to be Critical Drainage Areas, where surface water drainage systems are already considered to be overloaded.

The recommendations for SuDS and appropriate land management in the Weaver/Gowy and Mersey Estuary Catchment Flood Management Plans should be incorporated in future planning decisions.

5.11.3 Requirement for a Detailed Water Cycle Study

At this point it is not considered necessary for the Councils to embark on one or more Detailed Water Cycle Studies. The main reason for this is that whilst the study has highlighted constraints, and specific actions for the different parties, no constraints have as yet been identified that could justify a detailed study. In many cases dialogue between the Local Authorities, United Utilities, and the Environment Agency, and agreed phasing actions, is likely to be sufficient to ensure development is not unduly constrained. The workshops that were held during the delivery of this study were considered by the attendees as a valuable mechanism for promoting such dialogue, and it is recommended that these continue.

As development proposals are refined and United Utilities progresses its business plan, specific problems may be identified that require a more innovative approach to be resolved. If such a situation arises then a Detailed WCS may be required and justified.

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