Report No. B4027/FRA/01
March 2008

THE MERSEY GATEWAY PROJECT

FLOOD RISK ASSESSMENT

Gifford
20 Nicholas Street
Chester
CH1 2NX

THE MERSEY GATEWAY PROJECT

FLOOD RISK ASSESSMENT

C O N T E N T S

FIGURES

APPENDICES

1. INTRODUCTION

1.1 Foreword

1.1.1 Halton Borough Council ("the Council") is promoting a second road crossing of the River Mersey, within the Borough of Halton, between Runcorn and Widnes to be known as the Mersey Gateway. Gifford have been appointed as Lead Consultant to undertake studies and develop a reference design to take the project forward.

1.1.2 An environmental impact assessment (EIA) for the Mersey Gateway Project ("the Project") has been prepared. The EIA is the process by which information about the environmental effects of a project is collected, assessed and taken into account when determining whether the proposed development should be approved.

1.1.3 The EIA is reported in an Environmental Statement (ES). An ES is a publicly available document that sets out an assessment of the likely environmental effects of the proposed development. The ES is the product of consultation with relevant bodies and public authorities who have information in their possession and are required to make it available. All environmental statements must include a description of the project and a summary of its likely effects in non-technical language.

1.1.4 The ES prepared for the Project accompanies certain applications and orders that are required to authorise its construction, the details of which are set out in Chapter 2 of the ES. The ES has been prepared on behalf of the Council by its professional team. The applications and orders to which this ES relates to are:

a. Applications for planning permission in respect of certain works to the highway network in the Borough of Halton;
b. An application for an order under Section 3 of the Transport and Works Act 1992 (TWA) authorising the construction of works that interfere with navigation of the River Mersey ("the River") and other waterways;
c. Applications for listed buildings consent for works to certain listed structures including the existing Silver Jubilee Bridge (SJB);
d. An order conferring powers to levy charges for the use of the SJB; and
e. Other works and applications conferring powers (*inter alia*) to acquire land compulsorily and interfere with public rights of way (PRoW).

1.1.5 Certain information can accompany an ES, as listed at Section 1.5. This Report is the site-specific Flood Risk Assessment (FRA) and is presented in the ES as an Appendix to the Surface Water Quality Chapter. Site-specific FRAs must be submitted by a developer to accompany a planning application for certain types of development. An FRA may take the form of a stand alone document or it may form part of an ES. An FRA is required for the Project and, because it requires an ES, the FRA for the Project is incorporated into this ES.

1.1.6 This FRA has been prepared in accordance with the guidance given in policy document Planning Policy Statement 25: Development and Flood Risk (PPS25) (Communities and Local Government December 2006) and the consultation paper published by the Communities and Local Government in February 2007 entitled "Development and Flood Risk: A Practice Guide Companion to PPS25 - 'Living Draft'".

1.2 Background

1.2.1 The Borough of Halton ("the Borough") is located in the North West of England[1] at a strategic crossing point of the Mersey Estuary (the "Estuary").

1.2.2 The Borough comprises two principal towns Runcorn and Widnes, on the south and north side of the Estuary respectively, together with the four parishes of Daresbury, Hale, Moore and Preston Brook. The Estuary narrows significantly at one point, known as the 'Runcorn Gap', and thus provides a long-used crossing point. This is now spanned by the main rail connection between Liverpool and the West Coast Main Line (via the Aethelfleda railway bridge) and the A557 road link between the M62 and the M56, via the Silver Jubilee Bridge (SJB). The M62 and M56 motorways pass to the north and south of the Borough respectively with connections via the A562/A5300 and A557 to the M62, via the A557 to the M56 and via the A558 to the M56. To the west of Widnes the A562, Speke Road, links Widnes and the river crossing point to south Liverpool connecting to nationally significant ports and Liverpool John Lennon Airport. The M62 to the north of the Borough links the Liverpool City Region[2] to Manchester and thereafter crosses the Pennines to the Yorkshire conurbations. To the south, the M56 links North Wales and Cheshire[3] to Manchester. Halton is therefore located at the convergence of a number of strategic transport links in the North West of England, of which several rely upon river crossing at this point. Chief among these is the A557 crossing the SJB.

1.2.3 The SJB was opened in 1961 with two lanes of traffic and an opening year flow of less than 10,000 vehicles per day (vpd). When it was widened to four sub-standard lanes in 1977, the design capacity (measured using current maximum throughput standards) was increased to approximately 65,000 vpd. At present it regularly carries in excess of 80,000 vpd on weekdays and a figure of 91,000 vpd was recorded in 2007. These traffic flows, combined with the four sub-standard lanes and absence of any hard shoulder on the bridge, have inevitably led to regular service breakdowns on the SJB river crossing of the River. These include:

a. Routine congestion during peak travel periods;
b. Delays to local connecting roads due to queueing;
c. Safety hazard;
d. Poor regional road resilience to accidents and other incidents;
e. Difficulties in maintenance; and
f. Unreliable journey times.

1.2.4 These service failings have an adverse effect on travel within the Borough, they undermine the City Region's connectivity with the rest of the United Kingdom's road transport links, and the local community surrounding the SJB suffers a degraded environment and quality of life. The breakdown in transport connectivity and access is widely accepted as a threat to the economic prosperity of the sub-region which is manifest in the Project being determined as a key 'Transformational Project' in the North West Regional Economic Strategy.

[1] The North West of England is comprised of five sub regions including Cheshire, Cumbria, Greater Manchester, Merseyside and Lancashire.
[2] The Liverpool City Region comprises the Core City of Liverpool and local authority districts of St Helens, Wirral, Knowsley, Sefton, and Halton plus the adjacent areas of Warrington, Chester, Ellesmere Port and Neston (West Cheshire), North Wales and West Lancashire.
[3] Cheshire is split into 6 administrative regions: Crewe and Nantwich, Chester, Congleton, Macclesfield, Vale Royal and Ellesmere Port and Neston.

1.3 The Mersey Gateway Project

1.3.1 The aim of the Project is to deliver a new crossing of the River in Halton that links into the existing principal road network. It aims to provide effective road connections to the Liverpool City area from north Cheshire in the south, thereby providing effective connectivity for the sub-region and removing congestion from the Borough. The new road capacity provides an opportunity to re-balance the transportation infrastructure within Halton towards delivering local sustainable transport and economic goals.

1.3.2 The Project's scope covers the following:

a. The delivery of a new road crossing of the River in Halton, known as the Mersey Gateway Bridge;
b. Incorporation of the New Bridge into the existing highway network. These works are known as the Remote Highway Works;
c. Modification and de-linking of the SJB (excluding the asset management of the SJB works);
d. Integration of the revised route networks with public transport, cycle and pedestrian links across Halton;
e. Integration with the surrounding environment through landscaping;
f. Implementation of tolling and development of associated infrastructure;
g. Letting a concession for the construction, operation and maintenance of the Project.

1.3.3 The Council has established a number of strategic objectives for the Project, which are:

a. To relieve the congested SJB, thereby removing the constraint on local and regional development and better provide for local transport needs;
b. To apply toll and road user charges to both the New Bridge and the SJB consistent with the level required to satisfy viability constraints;
c. To improve accessibility in order to maximise local development and regional economic growth opportunities;
d. To improve local air quality and enhance the general urban environment;
e. To improve public transport links across the River;
f. To encourage the increased use of cycling and walking;
g. To restore effective network resilience for transport across the River Mersey.

1.3.4 In considering the viability of the Project it was determined that funding of the works would require the imposition of tolls / charges for the use of both the New Bridge and the SJB. The Council has established an approach to tolling that is intended to allow successful delivery of the Project within funding limits agreed with central government.

1.4 Environmental Impact Assessment

1.4.1 In accordance with European and UK law certain projects require a particular process of assessment by reason of their size, nature and the likelihood that they will have significant effects upon the environment. This assessment process is known as environmental impact assessment. Some projects are subject to an automatic requirement for EIA, principally those of very large size or with all-but inevitable adverse effects on the environment. Smaller projects are tested against a number of criteria to identify whether EIA is required.

1.4.2 Aside from its size, the Project is located close to a number of sensitive features, including residential and employment areas, areas of ecological importance, areas of cultural heritage interest, areas of contaminated land and important landscape feature areas. As a result EIA is required for the Project in line with the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (the "EIA Regulations").

1.5 Environmental Statement

1.5.1 The ES prepared for the Project documents the overall findings of the EIA. It is a legal requirement for applications relating to EIA projects to be accompanied by an ES.

1.5.2 The ES consists of three parts:

a. The ES - a comprehensive document drawing together all the relevant information about the project;
b. The Non-Technical Summary - a brief report summarising the principal sections of the ES in non-technical language, which is readily understandable by a wide audience, easily distributed and accessible in a range of different media types and formats;
c. Appendices to the ES.

1.5.3 In addition to the main body of the ES and its appendices, certain other documentation accompany this ES. These include a Flood Risk Assessment. This is a technical document providing an assessment of the Project's effect of and vulnerability to flood risk. The remaining sections of this report present the FRA for the Project.

2. PURPOSE OF STUDY

2.1.1 The purpose of this study is to assess the existing flood risk of the area in which the Project is to be located, the effect of the Project on flood risk and vice versa, and identify possible mitigation measures required for the Project, in accordance with PPS25.

2.1.2 The principle aim of an FRA is to establish the following:

a. Whether a proposed development is likely to be affected by current or future flooding from any source;
b. Whether it will increase flood risk elsewhere;
c. Whether the measures proposed to deal with these effects and risks are appropriate;
d. Whether the site will be safe to enable the passing of part c of the Exception Test if this is appropriate PPS25 Annex D9c.

2.1.3 The content of an FRA should be appropriate to the scale and nature of the development. The FRA prepared for the Project will cover various aspects relating to flood risk, flood management and drainage strategy. The FRA will provide commentary against the suggested FRA outputs presented in the guidance document Development and Flood Risk: A Practice Guide Companion to PPS25 'Living Draft' (Communities and Local Government, February 2007), repeated below:

Development Description and Location

a. What type of development is proposed and where it will be located?
b. What is its Vulnerability Classification?
c. Is the proposed development consistent with the Local Development Documents?
d. Evidence that the Sequential Test and, where appropriate, the Exception Test have been applied in the selection of this site for the development type proposed.

Definition of the Flood Hazard

a. What sources of flooding could affect the site?
b. For each identified source, describe how flooding would occur, with reference to any historic records wherever these are available.
c. What are the existing surface water drainage arrangements for the site?

Probability

a. Which flood zone is the site within?
b. Is there a Strategic Flood Risk Assessment covering the site?
c. What is the probability of the site flooding taking account of the contents of the SFRA and of further site-specific assessment?
d. What are the existing rates and volumes of run-off generated by the site?

Climate Change

a. How is flood risk at the site likely to be affected by climate change?

Detailed Development Plans

a. Details of the development layout, referring to the relevant drawings.

b. Where appropriate, demonstrate how land-uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding.

Flood Risk Management Measures

a. How will the site be protected from flooding, including the potential impacts of climate change, over the development's lifetime?

Off Site Impacts

a. How will you ensure that the measures to protect your site from flooding will not increase flood risk elsewhere?
b. How will you prevent run-off from the completed development causing an impact elsewhere?

Residual Risks

a. What flood-related risks will remain after you have implemented the measures to protect the site from flooding?
b How, and by whom, will these risks be managed over the lifetime of the development?

2.1.4 The objectives of this report are:

a. To provide baseline information against which future change can be compared;
b. To identify consequential variation in flood risk and indicate any requirement for mitigation measures;
c. To outline potential drainage solutions;
d. To provide information to enable relevant consents to be obtained.

2.1.5 The outputs from this report will:

a. Provide an understanding of the magnitude of current flood risk associated with tidal and fluvial influences affecting the study area;
b. Assess the effect of the flood risk upon the existing highway and vice versa;
c. Assess the effect of the flood risk upon the Project and vice versa.

3. STUDY AREA AND PROJECT DESCRIPTION

3.1 Introduction

3.1.1 This section describes the study area adopted for the Project, and the Project itself. It sets out the location of Halton in the UK and provides detailed descriptions of the study area following the alignment of the Project from the north of Halton in Widnes, across the Estuary, to the south of Halton in Runcorn. This study area forms the basis for all environmental assessments prepared for the ES, although some variations occur to meet the specific requirements and scope of particular topics.

3.2 National and Regional Location

3.2.1 Halton is located in the North West of England (see Figure 3.1) on the Mersey Estuary (the "Estuary"), approximately 24km from Liverpool and 45km from Manchester City centres[4]. Runcorn and Widnes were originally located within the county of Cheshire, however on 1 April 1998 they were united as Halton Unitary Authority.

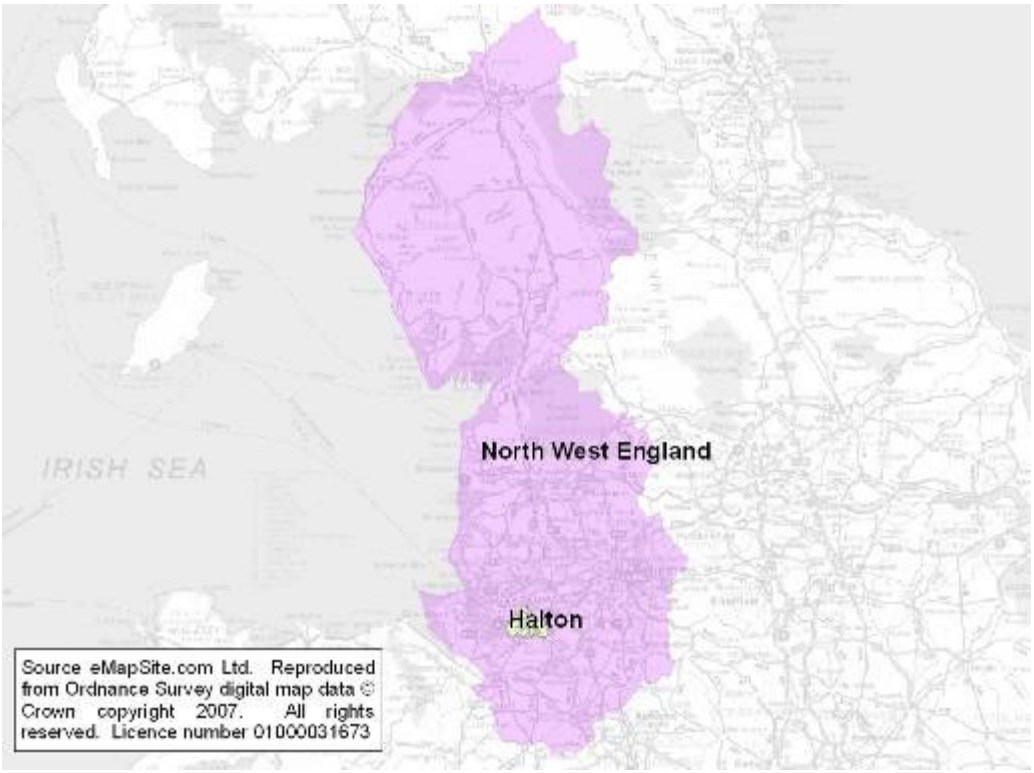


Figure 3.1 – Location of Halton in North West England

3.3 The Borough of Halton

3.3.1 Halton was formed in 1974 from the towns of Runcorn and Widnes together with the outlying rural villages of Hale, Moore, Daresbury and Preston Brook. The population of Halton stood at 119,500 in 2006, a decrease of over 2,000 compared to the figure of 1996. Deprivation levels are high in Halton with the Index of Multiple Deprivation[5] (IMD) figures for 2007 indicating that of

[4] Measurements are approximate and taken from Widnes Town Centre.
[5] There are 32,482 LSOAs in England. The most deprived LSOA for each Index is given a rank of 1 and the least

the 79 Super Output Areas (SOA[6]) in Halton, 46 are in the most 30% deprived SOAs in England and 21 are within 10% most deprived. The Project is located within the wards of Riverside and Ditton, to the north of the River and Mersey, Castlefields, Halton Brook, Grange, Heath, Halton Lea and Beechwood to the south of the River. A number of SOAs located within these wards (with the exception of Heath and Beechwood) have an IMD score within the top 20% most deprived in England.

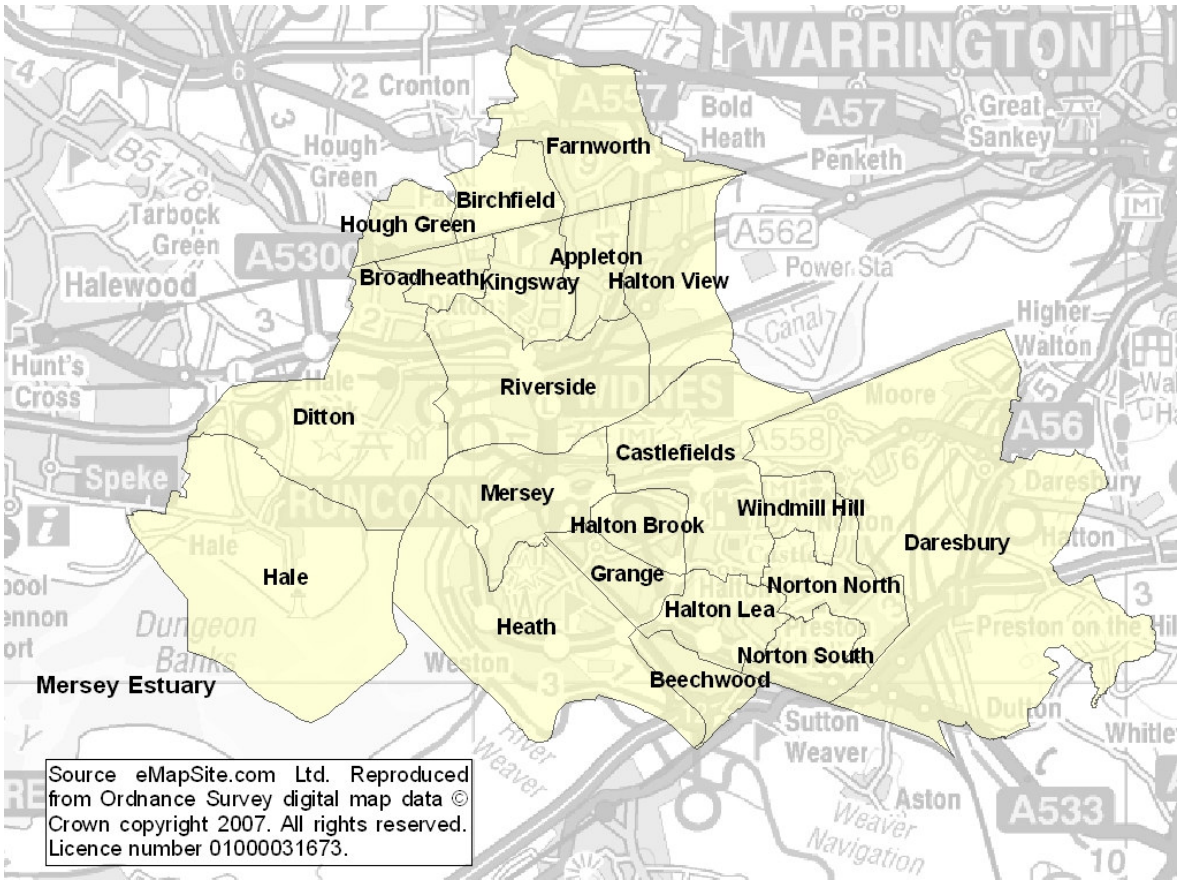


Figure 3.2 - Wards within Halton

3.3.2 The following provide a detailed description of the study area for the Project following its alignment from north to south.

3.4 Widnes

3.4.1 Widnes stands on relatively low-lying land on the north side of the River. New industrial areas and the remnants of the old industries lie between Widnes town and the River. Primary distributor routes by-pass the town to the east and south-west. Although grade separated junctions have generally been provided to connect to the district and local distributor roads, the system does not have segregated pedestrian, cycle and local bus traffic. The complex junction of the A562 Fiddlers Ferry Road and A557 roads that provides access to the industrial areas south-east of the town is not grade separated.

deprived LSOA is given a rank of 32,482, for presentation. The ranks show how an LSOA compares to all the other LSOAs in the country.

[6] SOAs are geographical areas of consistent size with unchangeable boundaries. A number may make up a single ward.

3.4.2 To the north west of the Ditton Junction is St Michael's Golf Course. This area is dissected by Speke Road and is located to the south of Widnes on the urban periphery close to the residential district of Lower House. A small surface stream, which ultimately becomes Stewards Brook, is located on the northern perimeter of the golf course, passing under Speke Road and heading towards the River. The site is currently disused, the golf course was closed to the public in 2004. The golf course comprises 30 hectares of reclaimed land from old chemical waste tips. Assessment work undertaken by the Council in 2004 identified high levels of soil contamination at the golf course, leading to its closure. All of the watercourses identified within the Study Area are presented in Appendix A.

3.4.3 To the south east of the golf course is Ditton Junction, which comprises an existing developed pocket of brownfield land (approximately 1.43 ha) at the junction of Ditton Road and Speke Road. Land on Lowerhouse Lane and an area of industrial units on Ditton Road are allocated for development for an employment use.

3.4.4 The Garston to Timperley freight railway line between Liverpool and Warrington passes through the south of Widnes, to the south of Ditton Junction.

3.4.5 To the south east of the Garston to Timperley freight line is an industrial area on the northern banks of the River. This area comprises industrial properties on Waterloo Road. Beyond this is an area of land allocated for employment use at the Catalyst Trade Park, which extends east to the western corner of the ThermPhos Chemical Works on Earle Road.

3.4.6 The residential area of West Bank lies immediately next to the River and SJB alignment at Runcorn Gap. This community is separated from the town by the A557 and the Victoria Road and Catalyst Trade Park industrial areas to its north.

3.4.7 Fiddler's Ferry Power Station stands on the north side of the River immediately to the east of the Borough, with Liverpool John Lennon Airport immediately to the west; both sides are outside the administrative area of Halton.

3.4.8 Bowers Brook and St Helens Canal watercourses are located to the north of the River. Bowers Brook is a culvert that runs to the north of the St Helens Canal. The St Helens Canal, also known as the Sankey Canal, is a canal linking St Helens to the River at Spike Island, Widnes, and was constructed primarily for the transportation of coal from the Lancashire coalfields to the developing industrial areas in the Mersey Basin. The section of the St Helens Canal in Widnes is owned by the Council and is currently disused. This canal is currently not navigable to most craft beyond Spike Island due to the presence of a fixed, low level, timber footbridge but still contains water and retains a leisure role, with the towpath providing the route for the Trans-Pennine Trail for walkers and cyclists. No closure order is in place for the canal.

3.4.9 The Trans Pennine Trail, a national recreational route for cyclists, horse riders and walkers, and part of the National Cycle Network, runs along the north bank of the River and follows the waters around West Bank and Spike Island before following the towpath of the St Helens Canal to Fiddlers Ferry Power Station.

3.5 Silver Jubilee Bridge & Aethelfleda Bridge

3.5.1 Runcorn and Widnes are currently connected over the River and Estuary by the SJB and the Aethelfleda railway bridge. These structures are Grade II and II* listed buildings respectively.

3.5.2 The SJB consists of four narrow lanes with no hard shoulder on the bridge. A narrow exposed pedestrian walkway is provided on the upstream side of the SJB. Cyclists should either use the traffic lanes or dismount and use the pedestrian walkway.

3.5.3 The railway line between Liverpool and London passes north-south through Runcorn served by a station in Runcorn Old Town, crossing the River at Runcorn Gap via the Aethelfleda railway bridge.

3.6 The Mersey Estuary

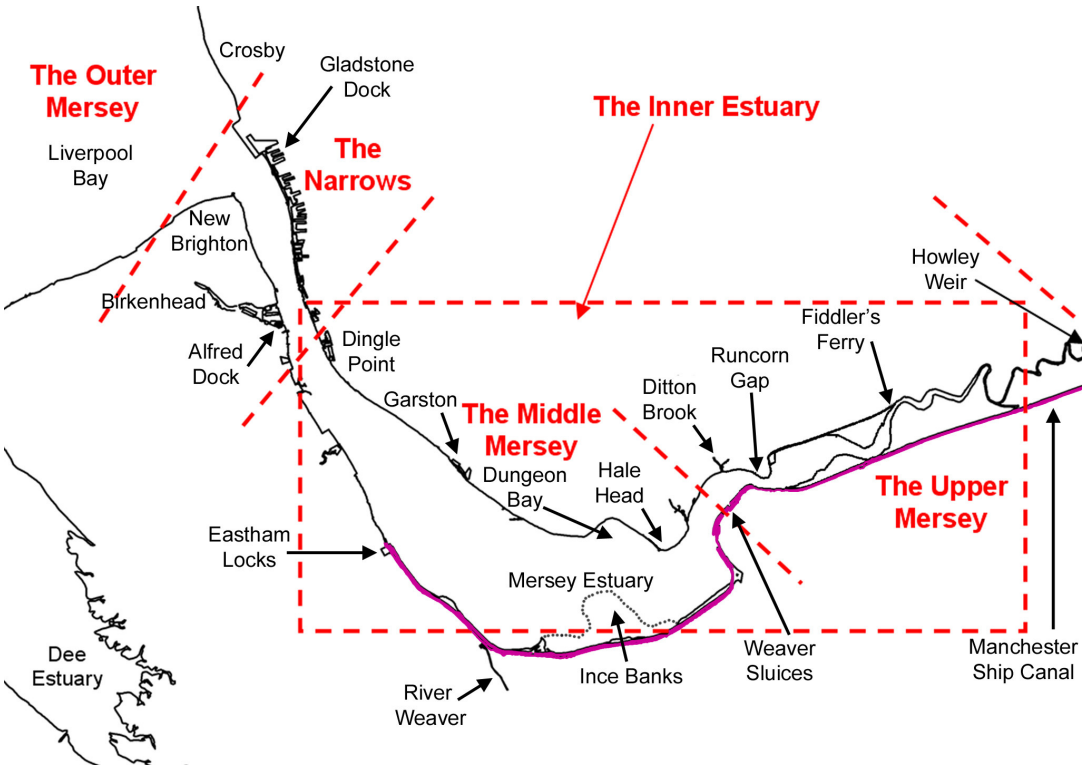
3.6.1 Halton and the surrounding area, including Liverpool, are dominated by the Estuary, a wide expanse of tidal water, sand banks and mud flats flanked, for the most part, by saltmarsh, except in the vicinity of the Runcorn Gap where the Estuary is narrowed by a rocky sandstone outcrop.

3.6.2 The Estuary is sited on the northwest coast of England, north and east of the Dee Estuary. The Estuary extends from Liverpool at the mouth, to the tidal limit at Howley Weir (Warrington), some 46 km upstream.

3.6.3 The Estuary can be divided into four regions (as shown in Figure 3.3 below) each of which is discussed in detail in Chapter 7 (Hydrodynamics and Estuarine Processes) of the ES:

a. The Outer Mersey (New Brighton to the seaward extent of the Training Walls);
b. The Narrows (Dingle Point to New Brighton);
c. The Middle Mersey (Hale Head to Dingle Point); and
d. The Upper Mersey (Howley Weir to Hale Head).

Figure 3.3 - The Mersey Estuary



Designations

3.6.4 There are a number of Local Wildlife Sites (LWS[7]) and Local Nature Reserves (LNR) in the Upper Mersey Estuary and Halton. These are designated primarily for wildfowl and waders but also because of the saltmarsh and associated inter-tidal habitats that are located upstream of the SJB.

3.6.5 In addition, immediately downstream of the SJB there are a number of sites with national and international designations, including:

a. The Mersey Estuary Site of Special Scientific Interest (SSSI) as designated under the Wildlife & Countryside Act (1981) (amended by the Countryside and Rights of Way Act 2000);
b. The Mersey Estuary Ramsar Site (as designated under the Ramsar Convention on wetlands of international importance);
c. The Mersey Estuary Special Protection Area (SPA) for Birds (as designated under the European Commission Council on the Conservation of Wild Birds (79/409/EEC) on April 1979); and
d. The Mersey Estuary European Marine Site.

3.6.6 The Ramsar Site, SPA and European Marine Site are collectively known as Natura 2000 Sites.

3.6.7 On the north bank of the Estuary is an area of saltmarsh known as Widnes Warth and, on the south bank, an area of saltmarsh known as Wigg Island (part of which is known as the Astmoor Saltmarsh). These areas, along with the Estuary habitats between them, are designated as a LWS. Wigg Island is also designated as a LNR and contains Wigg Island Community Park.

3.6.8 The Upper Mersey Estuary is also designated as an Area of Special Landscape Value (SLV) of local significance in the Borough, with Spike Island and Wigg Island designated as Important Landscape Features due to their value as public open space, for nature conservation and as industrial heritage.

Manchester Ship Canal and Other Canals

3.6.9 The Manchester Ship Canal (MSC) runs along the southern bank of the Estuary. It is 56km long and flows between Eastham in Wirral and Salford in Greater Manchester. The Ship Canal provides deep water access for shipping from the Estuary to Manchester and accommodates sea-going vessels. The Bridgewater Canal, which is available for use by private boats, begins near the centre of Runcorn Old Town and runs eastwards alongside the Runcorn Expressway (this canal is discussed in further detail below). This canal is used mainly as a cruising waterway.

3.6.10 A small section of the Runcorn to Latchford Canal is located to the north of the MSC on Wigg Island. This canal allowed navigation between Runcorn and Manchester until it was replaced by the construction of the MSC. Large sections of the Latchford Canal were used as part of the construction of the MSC leaving spurs where it deviated. A spur of the Runcorn to Latchford Canal remains within the Wigg Island Community Park. The Runcorn to Latchford Canal was the name given to one of the cuts dug as part of the Mersey and Irwell Navigation, which allowed navigation between Runcorn and Manchester. The Mersey and Irwell Navigation used

[7] Formerly known as Sites of Importance for Nature Conservation (SINCs)

new cuts to 'straighten' the line of the canal on its route from the Upper Mersey Estuary to Manchester.

3.7 Runcorn

3.7.1 The old town of Runcorn is separated from the Estuary by the MSC. In 1964 the New Town of Runcorn was developed, and by the mid 1970s had grown to cover the area between the old town and the M56 motorway. The New Town was planned around a system of high-standard primary distributor roads, having some grade separated junctions, and connecting to district and local distributor roads. Pedestrian and cycle traffic is segregated from the primary network using Greenways[8]. Purposes built routes, Busways, are provided for local bus services. New industry has been attracted to the Astmoor Industrial Estate (between the MSC and the New Town) in the north, at Preston Brook and Daresbury in the southeast. Heavy chemical industry still dominates the western side of the town, particularly at Weston Point.

3.7.2 Industrial units at the Astmoor Industrial Estate are located on the northern bank of the Estuary. To the south of which are the residential areas of Castlefields. As noted above, a number of SOAs within this ward scored in the top 20% most deprived in England (IMD, 2007).

3.7.3 The Bridgewater Canal passes to the immediate south of the Astmoor Industrial Estate. The Bridgewater Canal is a 65km long broad beam canal that links Runcorn to Leigh in Lancashire, with a spur to Castlefield in Manchester. To the south of the Bridgewater Canal and the Astmoor Industrial Estate are the Daresbury and Central Expressways.

3.7.4 The Central Expressway runs southwards to the Central Expressway and Weston Link Junctions, which connect the Weston Point, Rocksavage and Central Expressways. These junctions are surrounded by the residential areas of Halton Lea, Beachwood and Heath within which social facilities are located, such as schools, allotments and playing fields. To the east of Weston Point Expressway is an area of open space at Rocksavage.

3.7.5 The Flood Brook runs to the south east of these junctions, separated by the residential areas of Beechwood.

3.7.6 Junction 12 of the M56 Motorway is located to the south of Rocksavage on the urban periphery. This junction forms a key interchange between the M56 and the Central Expressway serving Runcorn and associated infrastructure. A railway line linking Frodsham Junction and extending towards Higher Runcorn and Dukesfield is located to the north west of this junction. The junction is bordered by Ashville Industrial Estate to the south and residential development at Beechwood to its north and west. The Weaver Navigation runs to its southwest serving the heavy industries situated on the northern bank of the Estuary in Runcorn to the west of Rocksavage.

3.8 Project Background

3.8.1 The Mersey Crossing Group was established in 1994 to promote the Project after the government of the time had confirmed that construction of a new crossing should be promoted at a local rather than national level. The Mersey Crossing Group is led by the Council and comprises the following:

[8] Greenways have no legal status. They comprise a network of largely car-free off road routes connecting to facilities, public transport interchanges and open spaces in and around towns and cities and to the countryside; for shared use by people of all abilities on foot bike, or horseback for commuting, play or leisure (Ref. 1).

a. Halton Borough Council;
b. Merseytravel;
c. Liverpool Chambers of Commerce and Industry;
d. Halton Chambers of Commerce and Enterprise;
e. English Partnerships;
f. Knowsley Metropolitan Borough Council;
g. Liverpool City Council;
h. St Helens MBC;
i. Warrington Borough Council;
j. Sefton MBC;
k. Wirral MBC;
l. Cheshire County Council;
m. The Highways Agency;
n. Government Office for the North West;
o. North West Development Agency;
p. Manchester Ship Canal Company (Peel);
q. Ineos Chlor;
r. Liverpool John Lennon Airport;
s. Jaguar;
t. ABP Ports.

3.8.2 The Mersey Crossing Group has access to the results of the Department for Transport's Mersey Crossing Study, which had identified the 'Runcorn Gap' as the optimum river crossing area to provide additional road capacity. A number of alternatives were considered for the Project. Details of the alternatives considered and the decisions that led to the selection of a new crossing (as opposed to other transport solutions) and the route to be taken forward are provided in Chapter 5 of the ES.

3.8.3 Findings as to the nature of the Project were presented to the Mersey Crossing Group on 8 April 2003, together with design information, financial costs, estimated economic benefits and other information. Based on this presentation, the Council and the Mersey Crossing Group decided unanimously to promote a new river crossing, using a route option known as Route 3A, subject to further consultation with the public and other stakeholders.

3.8.4 Having decided upon the route and a new fixed river crossing the Council submitted its conclusions to the Department for Transport (DfT) in July 2003. Following the submission of further information in 2004 the DfT entered the Project into its programme of major transport schemes in March 2006. This confirmed funding for the delivery of the Project and allowed it to be developed to the current stage where orders and applications are being submitted to secure statutory authorisation for its construction maintenance and operation.

3.9 Route Description

3.9.1 The works that comprise the Project run from the North West of Widnes to a junction with the M56 to the South of Runcorn. They also include the SJB. A scheme has been designed in outline to deliver the objectives of the Project, which is referred to as the "Reference Design". The alignment of the Reference Design is described in greater detail below.

3.9.2 The western extent of the proposed main alignment will be located in Widnes, along the A562 Speke Road to Liverpool, to the west of the existing Ditton Roundabout Junction (Junction of A562 and A533). The alignment will then head eastwards along the line of, and to the south of, Speke Road towards the Ditton Junction. It will then progress, via an embankment, across land

currently occupied by industrial units along Ditton Road and over the Garston to Timperley rail freight line, before crossing the alignment of the existing A557 Widnes Eastern Bypass (via a multi-span viaduct), the Catalyst Trade Park and the western corner of the ThermPhos Chemical Works. A new junction (the "Widnes Loops Junction") will be formed with the A557 at this location. The alignment will then continue south eastward over the St Helens Canal, Widnes Warth Saltmarsh, the Estuary, Astmoor Saltmarsh and Wigg Island, before turning south over the MSC and Astmoor Industrial Estate. The alignment will then connect into the existing road network in Runcorn at the Junction of the A533 Bridgewater and Central Expressways with the A558 Daresbury Expressway (the Bridgewater Junction). The route will continue south along the Central Expressway (A533) towards the junctions of the Central/Southern Expressways and the Weston Point Expressway/Weston Link (known respectively as the Lodge Lane Junction and Weston Link Junction). The alignment will finally join the M56 Motorway at Junction 12.

3.9.3 For the purposes of understanding and describing the works in the ES, and carrying out the EIA, the structural, highway and construction works for the Project have been split into a number of parts (known as "Construction Areas") (A to I as shown below on Figure 3.4). These components reflect the individual construction areas described within the Construction Method Report (CMR) within the ES. The construction areas include the following:

a. Area A – Main Toll Plazas;
b. Area B – Ditton Junction to Freight Line;
c. Area C – Freight Line to St Helens Canal including Widnes Loops Junction;
d. Area D – Mersey Gateway Bridge;
e. Area E – Astmoor Viaduct;
f. Area F – Bridgewater Junction;
g. Area G – Central Expressway, Lodge Lane Junction and Weston Link Junction;
h. Area H – M56 Junction 12; and
i. Area I – Silver Jubilee Bridge and Widnes De-linking.

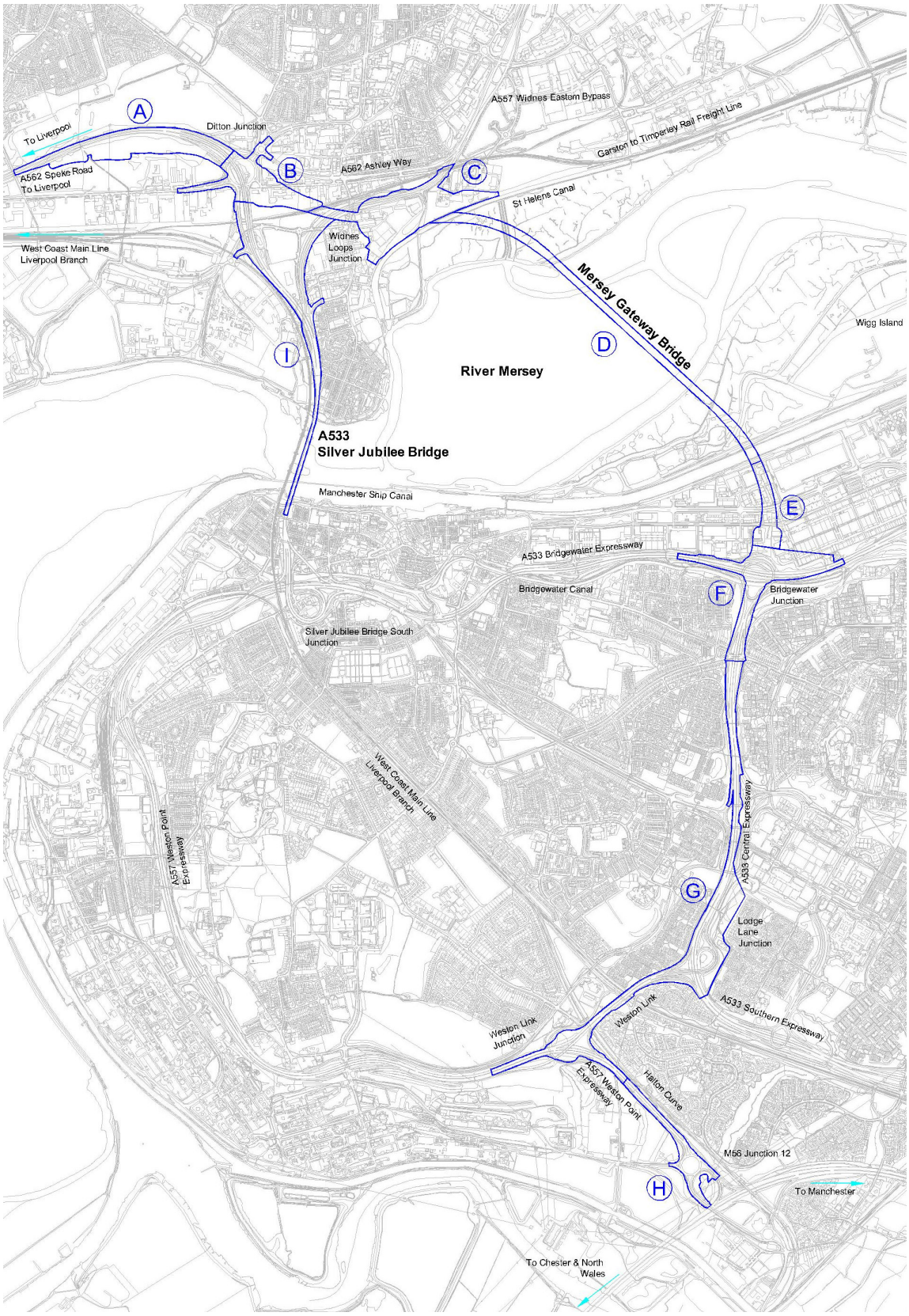


Figure 3.4 - Mersey Gateway Project Construction Areas

3.9.4 The following provides a summary of the highway and structural design for the Project within each of these construction areas

Area A - Main Toll Plaza

3.9.5 The Main Toll Plaza provides the location of where tolls may be collected for crossing the New Bridge. As the Project must provide for barrier tolling technology it is necessary to provide an area sufficiently large for vehicles to slow, wait and pass through barriers without having a detrimental effect on traffic flows. Toll plazas are situated on one side of the Mersey only because this minimises land-take, allows construction of necessary resources and means that this type of work can be restricted in the extent and location of any of its effects. The toll plaza will require approximately four hectares of land to accommodate the northbound and southbound tollbooths and will be at or just above existing ground level. No major earthworks are envisaged because the land at this location is already relatively flat. Where the Toll Plaza is above ground then fill will be imported. Tolling structures will be required, which are likely to comprise canopies providing sufficient headroom over tollbooths and their equipment for normal traffic use.

3.9.6 Extended link roads to the north and south of the Main Toll Plaza carriageway that bypass the tollbooths will be provided to allow access from Speke Road to Ditton Junction for vehicles not wishing to use the New Bridge. The north edge of the north link road will coincide with the northern edge of the existing southbound carriageway of Speke Road.

3.9.7 Because of the historic industrial activity on this site, this area is known to contain residual contamination within the superficial (near surface) made ground deposits. The Main Toll Plaza area itself is at, or about, existing ground level and will be formed on a relatively thin layer (approximately 1m average thickness) of imported fill material supported on the superficial deposits which may very well be subject to ground improvement techniques to control settlement.

3.9.8 Excavations will be avoided wherever possible to minimise the need to dispose of arisings that may be contaminated. Drainage and other trench arisings will be incorporated into other areas of fill if possible but will otherwise require to be taken to a licensed tip.

3.9.9 Stewards Brook and a public footpath pass beneath the existing Speke Road to the west of the proposed tolling areas. This brook is contained within a culvert which will need to be extended in length to the south to accommodate the increased width of the carriageway at that location. The public footpath will be diverted around St Michaels Road.

3.9.10 Balancing ponds may be formed to the south of the new carriageway on either side of Stewards Brook to control the highway surface water outfall flow rate into the brook. Other drainage attenuation (i.e. flow restricted) options may also be suitable.

Area B – Ditton Junction to Freight Line

3.9.11 Ditton Junction will be changed from a roundabout to a signal-controlled junction. The new carriageway will increase in level on an embankment as it approaches the new grade separated junction and will be taken over the new ground level link, between Ditton Road and Moor Lane South, on a new, two-span bridge.

3.9.12 The southbound on-slip and the northbound off-slip will also feature toll collection facilities.

3.9.13 An embankment of up to 9m high will be formed. This crosses land currently occupied by industrial buildings and a scrap metal yard and it is assumed that these areas will require treatment (owing to contamination) prior to construction of the embankment.

3.9.14 Because of the historic industrial activity on this site, this area contains residual contamination within the superficial (near surface) made ground deposits. Excavations will be avoided wherever possible to minimise the need to dispose of contaminated arisings. Drainage and other trench arisings will be incorporated into other areas of fill if possible but will otherwise require to be taken to a licensed tip. The same will be true of the modifications to the highway links and alignment associated with the amendments to the local road system to tie into the new junction arrangement.

3.9.15 Ditton Road is a long established corridor for services and many of these will need to be diverted to accommodate the revised highway alignment. These will include diversions of electricity, gas, water, sewage and telecommunications mains. The Scottish Power Manweb electricity substation adjacent to the Anglo Blackwell compound on Ditton Road will require relocation.

Area C – Freight Line to St Helens Canal

3.9.16 The following new structures and earthworks will be required in this section of the works:

a. The Freight Line Bridge - a single-span bridge over the Garston to Timperley Rail Freight Line.
b. Victoria Road Viaduct - a high level, multi-span viaduct connecting the Freight Line Bridge to the edge of the Widnes Loops Junction including the crossing of Victoria Road.
c. Two bridges over the new Widnes Loops Junction carriageways.
d. Embankments carrying the new carriageway at high level.
e. A bridge to carry the Widnes Loops Junction southbound on-slip over itself.
f. Toll plazas connecting the New Bridge to the Widnes Eastern Bypass.
g. The St Helens Canal Bridge - the high level bridge crossing the potential development corridor to the north of the St Helens Canal and the crossing of the St Helens Canal itself, which would then land on the north abutment of the Mersey Gateway Bridge.

3.9.17 This area forms the link between the New Bridge and the existing A557 Widnes Eastern Bypass that connects with Junction 7 of the M62 to the north. It will be formed primarily by substantial earthworks formed probably from excavated arisings from the redundant Widnes Eastern Bypass, supplemented by imported fill.

3.9.18 The new road between the Freight Line and the Widnes Loops Junction will be carried on a multi-span reinforced concrete structure. Finishes will be to a high quality specification and the area landscaped upon completion of the works.

3.9.19 The structures within the Widnes Loops Junction will either be portal or box structures in reinforced concrete constructed within the earthworks.

3.9.20 It is also expected that works may be needed in this area to contain or treat the contamination present in the soils under the footprint of the new earthworks.

3.9.21 The new carriageway will be taken over the St Helens Canal on a new, reinforced concrete structure, integral with the north abutment of the New Bridge. It will be formed at a height sufficient to permit a further structure to be constructed under it to carry a future light rapid transit system (or similar) system at a level to match the possible running surface within the New Bridge and still preserve the required headroom of 5m for craft that may at some future time use the canal.

3.9.22 During construction of the New Bridge, it is expected that the St Helens Canal area will form the main reception/transition area for the main bridge units that will form the decks. As such, it is assumed that it will be necessary temporarily to infill the canal (maintaining its drainage water transfer function) to provide a working area. On completion, the canal will be reinstated with some minor changes to the alignment. A corridor for the Trans-Pennine Trail cycle and footpath will be maintained throughout the works.

3.9.23 Upon completion of the Project a landscaping scheme will link the new earthworks with the leisure facilities offered by Spike Island, the St Helens Canal and the Trans-Pennine Trail.

Area D – Mersey Gateway Bridge

3.9.24 The New Bridge will have a total length of around 2.13km from abutment to abutment. The New Bridge will consist of approximately 550m of approach spans from the north abutment to the edge of Widnes Warth Saltmarsh, and 580m from the edge of Astmoor Saltmarsh, over part of Wigg Island, over the MSC and onto the south abutment within the Astmoor Industrial Estate. The New Bridge over the Estuary itself will consist of 1,000m of cable-stayed bridge consisting of up to four spans supported by three towers. The towers will be circular with a diameter of about 10m at water level, but will taper and include architectural features throughout their height.

Typical span lengths of the approach viaducts are 70-100m with an overall deck depth of around 6m. Both approach viaducts are twin, separate structures supported on their own independent substructure. There will be a total of 30 piers on the saltmarshes. Each pier will be of reinforced concrete of about 2m by 5m and the height would vary between 12m (north) and 23m (south) to suit the vertical profile of the deck.

The three towers of the cable-stayed spans are assumed to be concrete below deck level and steel above. The overall height of the towers will be around 120 -140m above the River level.

3.9.25 The decks of the cable-stayed spans will be twin parallel decks, similar in form to the approach viaducts, connected at positions of cable stay attachment. The cable stays are arranged in pairs in a harp (i.e. parallel) configuration.

3.9.26 The foundations are piled throughout the length of the New Bridge. The depth to rock is greater at the north side of the Estuary. Therefore, foundations for piers will get progressively shallower as they near the MSC.

Area E – Astmoor Viaduct

3.9.27 The new carriageway crosses the Astmoor Industrial Estate at a height of approximately 24m above existing ground level. The area will need to be cleared of existing light industrial buildings. The deck of the new viaduct is likely to be constructed in situ on a temporary scaffold falsework. On completion of the works, the area below the viaduct will be available for future development.

3.9.28 The area between the south abutment of the New Bridge and Bridgewater Junction will comprise a high-level, multi-span viaduct called Astmoor Viaduct. This will cross the existing industrial park at considerable height, linking the high level crossing of the MSC with the new crossing of Bridgewater Junction.

3.9.29 This elevated structure will vary in width up to a maximum of 60m wide before the southbound slip road splits off onto a separate alignment. The structure splits again at the point where the northbound on-slip road merges with the main line. The main line of the New Bridge will remain at high level while the two slip roads reduce in level to the south to allow the slip roads to tie in with the roundabout at Bridgewater Junction.

3.9.30 The north end of Astmoor Viaduct will land on the south side of the south abutment of the New Bridge. The south abutment of the Astmoor Viaduct will be approximately 85m wide and will be at three levels. The abutment wall will retain the end of the embankment up to Bridgewater Junction.

3.9.31 The viaduct will be 340m long and will comprise 12 spans; 20m end spans and 30m intermediate spans.

3.9.32 The deck will be supported by reinforced concrete plate piers, approximately 2m long by 5m wide, with four separate piers at each bent (line of support).

3.9.33 Piled foundations have been assumed. However, bedrock is at shallow depth beneath this viaduct and it may be possible to use spread foundations bearing directly on the bedrock in places.

Area F – Bridgewater Junction

3.9.34 Like the Widnes Loops Junction, the Bridgewater Junction is a complex of structures and slip roads that provide grade separation and access to and from the Central Expressway (running north to south) and the Daresbury/Bridgewater Expressways (running east to west). The existing through Daresbury/Bridgewater Expressway will be closed and brought into the new roundabout. A two-level interchange is proposed with east-west movements at the lower level and the new road linking to the Central Expressway at the higher level. The lower level will contain the gyratory system, linking slip road movements. The upper level structure is likely to be a five-span steel and concrete viaduct. Similar construction materials will be used for the construction of the new slip road bridges over the Bridgewater Canal. The existing bridges over the Bridgewater Canal will be removed. However, the existing bridges over the Daresbury/Bridgewater Expressway will be retained, although they will no long span across a live carriageway. The construction can be phased to coincide with routine winter closures of the canal. Retaining walls are also proposed so that adjacent slip roads at different levels to the main carriageway can be kept tight within the junction without the need for an embankment therefore limiting land take.

3.9.35 Traffic management of the existing traffic flows during the construction phase will affect construction methods and materials. A major feature of the works in this area will be the safe demolition of the existing structures. Otherwise, the works are essentially self-contained and can therefore be undertaken independently from the other work areas.

3.9.36 The five-span high level viaduct will be about 150m long and 27m wide. The substructure will be of piled foundations and reinforced concrete piers. The superstructure will be of prefabricated steel or prestressed concrete beams to allow erection to fit in with the phased traffic management regime that will be required to maintain traffic flows during the works.

3.9.37 High abutment structures will be required at both ends of the New Bridge. The south abutment will be on the south bank of the Bridgewater Canal.

3.9.38 The two existing slip road bridges will need to be replaced with two new slip roads bridges on the new alignment of the slip road off the new roundabout. These will be single span bridges with prefabricated steel or prestressed concrete beams used to form the decks over the canal.

3.9.39 The existing highway alignment will be re-configured to incorporate the New Bridge and to change the priority of the existing expressways. The free flow link between the Bridgewater and Daresbury Expressways will be removed and replaced by linking into the new roundabout that will be formed at the centre of the junction.

3.9.40 The embankments between this junction and the Central Expressway will be modified for the alignment of the New Bridge and the re-aligned slip roads. This tie-in between the new carriageway and the existing Central Expressway will be at Halton Brow.

Area G – Central Expressway, Lodge Lane Junction and Weston Link Junction

3.9.41 Improvements will be required to the alignment of the Central Expressway to bring it up to current geometric standards and to manage its interface with the New Bridge. These should not involve significant earthworks and will be undertaken generally within the existing highway boundary.

3.9.42 The distance between existing junctions along the Central Expressway is too close to meet current merging and weaving standards. The current carriageway configuration will be modified so that the alignment passes through this corridor with connections only at Bridgewater Junction and Lodge Lane Junction. This will be achieved by converting the existing hard shoulders into distributor lanes with no direct connection to the New Bridge at Halton Brow and Halton Lea Junctions. The existing hard shoulders will need to be strengthened to carry full highway loading and road markings and barriers will be added to prevent merging movements.

3.9.43 Two existing footbridges will be modified and extended.

3.9.44 Lodge Lane Junction will be modified to change the priority of traffic flow from the Southern Expressway to the Weston Link. The junction will be modified to make provision for dual two lanes of through traffic from the Central Expressway to the Weston Link with single lane slip roads for traffic movements to and from the Southern Expressway. These works will comprise the construction of a new single span bridge, along with modifications to the earthworks and highway alignment.

3.9.45 Weston Link Junction will be modified to change the priority of traffic flow from the northbound to the southbound section of the Weston Point Expressway. These works will use most of the existing junction layout; however, a new slip road will be constructed on the north side of the existing Weston Link Slip Road to allow traffic to slip onto the New Bridge from the northern section of the Weston Point Expressway.

Area H – M56 Junction 12

3.9.46 The existing roundabout to the north of the M56 Junction 12 will be modified to include a signal controlled link directly across the centre of the existing roundabout for the main line of the new highway, leaving the outer roundabout segments for local turning traffic and for eastbound access to the M56 Junction 12. The works will comprise carriageway realignment and the installation of new traffic signals. A new retaining wall will be required to support the carriageway realignment on the south side of the roundabout.

Area I – Silver Jubilee Bridge and Widnes De-linking

3.9.47 The opening of the Project will result in a significant reduction in traffic flow on the SJB. This will allow the downgrading of the carriageway on the existing bridge from two lanes in each direction to a single lane in each direction. This in turn will release space on the deck of the bridge to re-introduce footpaths and to provide a dedicated cycle path. These works will require the re-configuration of the deck layout and will involve kerbing, re-surfacing and the provision of new road markings.

3.9.48 The substandard footpath cantilevered on the east side of the SJB could then be closed, although its structure would be retained to support services.

3.9.49 A tolling plaza will be constructed on the existing carriageway of Queensway approximately 330m to the north of the SJB. The embankment and viaduct linking to the Widnes Eastern Bypass will be removed by excavation and the use of concrete breakers. The link to Ditton Junction will be downgraded to comprise just the existing slip road. The main carriageway and structures will be removed between the Queensway tollbooths and Ditton Junction.

3.9.50 The main link between the SJB and Ditton Junction (after passing through the tolling plaza) will be along the existing northbound slip road. This needs only be a two-lane single carriageway. A new signal controlled junction will be needed to replace the one-way off and on slips. The remainder of the existing dual carriageway to Liverpool will be closed to traffic and demolished.

3.10 Construction Phase

3.10.1 It is anticipated that construction methods required for all elements of the Project are likely to have environmental implications. As such, the construction phase for the Project was a key consideration in the EIA.

3.10.2 The CMR provides a detailed description of the construction methodology, which is likely to be employed to build the Project including the following detail:

a. Description of the works;
b. Site access arrangements;
c. Site clearance and demolition requirements;
d. Detailed construction methods;
e. Construction vehicle movements; and
f. Programme, phasing and traffic management.

3.10.3 As such the CMR forms a basis for the assumptions within this ES. It informs short-term and temporary construction related effects as well as some aspects of the final built form and its impacts.

3.10.4 As the Project will be constructed by a Concessionaire who is yet to be appointed it is not possible to predict the techniques and technologies to be adopted with absolute certainty. This is important because the EIA process still requires assumptions to be made as to the manner of construction of the Project. These assumptions are used to predict environmental effects, especially during the construction phase. In order to ensure that the effects actually experienced during the Project are the same as, or more benign than, those predicted, legal requirements are imposed upon the manner of carrying out the Project. However, to provide flexibility for the Concessionaire it is undesirable to specify the techniques to be employed unless absolutely necessary. Accordingly, the CMR is used to predict limits on outputs that may be imposed. Then, if a Concessionaire does not need the assessed methodology, an alternative methodology will be acceptable provided that it is environmentally equal to or better than the outputs of the assessed methodology, and it will be incumbent upon the Concessionaire to demonstrate that this is the case.

3.11 Landscaping

3.11.1 Landscaping will be required to integrate the Project into the existing landscape/townscape. The landscaping scheme will ensure that existing features of the townscape and riverside environments are enhanced and important features and sight lines are preserved.

3.12 Tolling and Road User Charging

3.12.1 The Project will be procured as a Design Build Finance and Operate (DBFO) scheme. This means that one organisation, known as a concessionaire, will be responsible for the detailed design, maintenance, construction and operation of the scheme. It will then operate the Project for a period until it has recovered its expenses and made a suitable return on its investment. For schemes of this nature the concession period is typically 30 to 40 years. Although the DfT is contributing around 25 percent of the funding required, the Project will be funded mainly through the toll revenue secured. The Concessionaire will obtain financial loans from banks or other lending institutions, secured by the expected toll revenues received over the concession period, This will allow the Concessionaire to construct, operate and maintain the scheme for a defined concession period. The funding from central government, currently proposed in the form of PFI Credits, will act as a subsidy towards the revenue required to support the private finance arrangement, that will assist in keeping toll charges to the minimum required to fund the project The Concessionaire will repay the finance that they have raised to construct the scheme over the period of the concession contract.

3.12.2 The finance for the Project is therefore reliant on revenue recovered from users of the Project through tolling and/or road user charging. To sustain revenue and to also ensure that the Project will ease local congestion it is proposed that tolls/charges will be levied for use of both the New Bridge and the SJB.

3.12.3 The tolling/charging regimes will also provide a mechanism to manage demand, so that free flow traffic conditions are maintained on the New Bridge and SJB. Influencing future traffic demand through toll and road user charging is intended to achieve service reliability and standards and to deliver the environmental benefits throughout the foreseeable future.

3.12.4 The removal of non-local traffic from the SJB will provide an opportunity for the SJB to be dedicated to local transport use. The reconfigured SJB will enhance facilities for public transport, cyclists and pedestrians. If the SJB remained in use at a heightened flow delivering these objectives would not be possible. Therefore, tolling/charging for use of the SJB would protect these local transport priorities against future congestion on the local road network

connecting to the SJB. This is particularly important because the New Bridge will not contain facilities for cyclists and pedestrians.

3.13 Tolling Infrastructure

3.13.1 The current design assumes that the technology used to collect toll / charge payments from drivers is similar to that currently used on the Mersey Tunnels and elsewhere on the UK road network.

3.13.2 For the New Bridge, toll plazas will comprise 8 tolling lanes on each carriageway. The width of each toll plaza will be about 40m. Tolling booths will also be provided on the slip roads from Ditton Junction and on the link with the A557. The main toll plazas will be located to the north west of the current Ditton Roundabout at or close to existing ground level. Tolled slip roads will also be provided from the New Bridge onto Ditton Junction for local traffic, on the A557 Widnes Eastern Bypass that connects with Junction 7 of the M62 to the north and on the Queensway approach to the SJB.

3.13.3 In addition to the tolling booths, administration and staff welfare facilities will be provided. It is likely that these will be located adjacent to the main tolling facilities to the west of Ditton Junction. Welfare facilities will also be provided at the tolling area for the A557.

3.13.4 The SJB will be tolled from booths constructed on the existing infrastructure. Welfare facilities will be provided in the vicinity for the toll operator staff.

4. RELEVANT LEGISLATION AND POLICY

4.1 Introduction

4.1.1 The susceptibility of land to flooding is a material consideration in determining planning applications. The potential consequences for occupiers, either of the development or elsewhere, in terms of personal safety and financial risk can be serious. Consideration must be made of the specific risk of flooding to the development being proposed over its expected lifetime, and its possible effects on flood risks elsewhere in terms of its effects on flood flows and flood storage capacity and the run-off implications.

4.1.2 Any activity likely to have a direct and adverse effect on a watercourse or its flood defences, that would impede access to flood defence and management facilities, or where the cumulative impact of such developments could have a significant effect on flood storage capacity or flood flows, should be avoided. The aim of a FRA is to help strengthen the co-ordination between land use and development and give guidance to the Local Planning Authority to regulate and control all developments within a drainage catchment.

4.1.3 Legislation and policies relevant to the appraisal of flood risk have been examined and considered as part of this assessment. Relevant legislation and policies are presented as follows.

National Legislation

4.1.4 The key legislation considered relevant as part of this assessment includes the following:

a. The Water Resources Act 1991;
b. The Land Drainage Act 1991;
c. The Highways Act 1980.

Water Resource Act 1991

4.1.5 The Water Resources Act 1991 (WRA) sets out the responsibilities of the EA in relation to water pollution, resource management, flood defence, fisheries, and in some areas, navigation. The WRA regulates discharges to controlled waters, namely rivers, estuaries, coastal waters, lakes and groundwaters. Discharge to controlled waters is only permitted with the consent of the Environment Agency. An aim of the Act is to ensure that the polluter pays the cost of the consequences of their discharges.

4.1.6 The WRA states that no person shall erect any structure in, over or under a watercourse which is part of a main river except with the consent of and in accordance with plans and sections approved by the Authority.

4.1.7 The watercourses in the area that are designated as main rivers that may be effected by the proposed scheme are Stewards Brook and Bowers Brook. A flood defence consent will be sought for works within these watercourses before work begins. The New Bridge will not require a consent as the Mersey at this point is not a main river. Consent for the bridge will be under legislation of the TWA.

Land Drainage Act 1991

4.1.8 The Land Drainage Act 1991 in respect of flooding states that "No person shall (a) erect any mill dam, weir or other like obstruction to the flow of any ordinary watercourse or raise or otherwise alter any such obstruction; or (b) erect any culvert that would be likely to affect the flow of any ordinary watercourse or alter any culvert in a manner that would be likely to affect any such flow, without the consent in writing of the drainage board concerned"

4.1.9 Therefore for any form of obstruction to the flow on ordinary watercourse flood defence consent will be sought from the Environment Agency.

The Highways Act 1980

4.1.10 The Highways Act 1980 gives the Highways Agency the right to discharge run-off from Motorways and Trunk Roads into inland, tidal or groundwater but is subject to the WRA requirement not to pollute.

4.1.11 The Highways Act also, in concert with provisions of the Land Drainage Act 1991 (Section 17 or Section 23), the Water Resources Act 1991 and the Environment Act 1995, controls applications for discharges to surface waters. Applications are made to the Environment Agency who determines the application based on the composition and volume of the discharge, the existing quality of the receiving water and the quality objectives of the receiving water. Recently, the Environment Agency has begun using the "Environmental Capital" approach to identifying the roles and importance of the receiving water in planning water management and in assessing discharge applications.

4.1.12 The relevance of this legislation is that discharge applications to the surface waters, both during construction and following construction will have to be made to the Environment Agency, who will use this, and associated legislation noted above, to control pollution and liquid emissions into surface waters.

National Policy Guidance

4.1.13 National Policy guidance relevant to flood risk and the Project comprise the following:

a. Planning Policy Statement 25: Development and Flood Risk;
b. Development and Flood Risk: A Practice Guide Companion to PPS25 'Living Draft' - A Consultation Paper (February 2007).

Planning Policy Statement 25: Flood Risk and Development (PPS25)

4.1.14 Planning policy statements set out the Government's national policies on different aspects of land use in planning in England.

4.1.15 PPS25 is the national guidance on development in a flood plain. The aim of PPS25 is to ensure flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and, where possible, with an overall reduction to flood risk. The guidance covers six key areas, against which a proposed development is assessed by the local planning authority:

a. Planning and flood risk - the planning process operates in a strategic manner;
b. Assessment of flood risk at a regional, local, and site level;

c. The Sequential and Exception Tests;
d. Managing surface water;
e. Risk management by design;
f. Residual risk.

4.1.16 The Project is a key requirement of local planning strategy to provide a new road link across the River and alleviate known issues on the adjacent Silver Jubilee Bridge. As such it is inevitable that the New Bridge is located within a zone of flood risk. However, the design has been carried out to mitigate the risk of flooding on the bridge deck and general carriageways. As this document lays out, the local issues of flood risk are also mitigated and so it is believed that the proposed development fulfils the rigour and justification required by PPS25 and also addresses issues of climate change.

Development and Flood Risk: A Practice Guide Companion to PPS25 'Living Draft' - A Consultation Paper

4.1.17 Following the publication of PPS25 the Government produced consultation paper 'A Practice Guide Companion to PPS25 - 'Living Draft'. This paper provides advice on practical implementation of the policies described in PPS25, referring to existing guidance wherever possible.

4.1.18 The Living Draft has been used as guidance throughout the compilation of this flood risk assessment.

Regional

4.1.19 Regional Policy guidance relevant to flood risk comprises the following documents:

a. Regional Planning Guidance for the North West
b. Draft Regional Spatial Strategy for the North West of England.
c. Regional Flood Risk Appraisal.
d. Catchment Flood Management Plan
e. Shoreline Management Plan for the Mersey.

Planning Guidance for the North West

4.1.20 The North West planning bodies have produced a Regional Planning Guidance for the North West (RPG13). Policy ER8 of RPG13 relates to Development and Flood Risk. This policy advises that in preparing development plans, and other relevant strategies and considering individual planning proposals, local authorities should apply the precautionary principle. In accordance with this principle they will make use of the Indicative Flood Plain Maps, Shoreline Management Plans, Estuary Management Plans and local EA Plans to develop the information necessary to apply the sequential approach to flood risk set out in PPS25.

4.1.21 RPG13 requires local authorities to:

a. ensure that built development is wholly exceptional and limited to essential transport and utilities infrastructure in areas of functional flood plains;
b. apply the precautionary principle, using the sequential approach, to developments in areas at risk of flooding. In the North West, areas of greatest risk are the River Mersey network and the River Dee and its estuary;
c. discourage inappropriate development in areas at risk from flooding;

d. avoid development which could lead to flood risk elsewhere either by reducing the ability of plains to store floodwaters or by creating unacceptable increases in surface run-off;
e. support the protection, management and developments of flood defences and promote the use of Sustainable Drainage Systems (SUDS) in all new developments;
f. take account of the longer-term impacts of climate change.

Draft Regional Spatial Strategy for the North West of England

4.1.22 The draft Regional Spatial Strategy for the North West of England makes reference to flood risk at policy EM5 - Integrated Water Management. The requirements of the emerging policy are:

a. that a Sequential test is carried out;
b. that any development which, exceptionally, must take place in current or future flood risk areas are resilient to flooding, protected to appropriate standards and does not increase the risk of flooding elsewhere;
c. that new, and, where possible, existing development must incorporate SUDS and water conservation and efficiency measures.

Catchment Flood Management Plan (CFMP)

4.1.23 The CFMP is a high level strategic planning tool; which provide policies that the EA planners will adopt in order to manage flood risk over the next 50 to 100 years.

4.1.24 The EA is in the process of preparing Catchment Flood Management Plans (CFMPs) for all river catchments within England. The Plans set out broad level of flood risk posed to development, communities and assets, and presents its policy for managing risk in each catchment in the short, medium and long term.

4.1.25 The CFMP for the Mersey makes specific mention of the Project with respect to possible effects on environmental issues. There is no specific reference to flood risk and flood risk management.

4.1.26 The CFMP makes reference to the Widnes area in Policy Unit 10. The Policy Unit suggests that further action should be taken to sustain the current scale of flood risk into the future; responding to the potential increases in flood risk from urban development, land use change, and climate change.

Shoreline Management Plan

4.1.27 Shoreline Management Plans (SMPs) are prepared by Maritime Local Authorities with the EA and perform a similar function to CFMPs but for the coast. In addition to these documents, the EA prepares Flood Risk Management Strategies for groups of assets, sub-catchments and estuaries, which are used to plan their investment strategies.

4.1.28 The EA is also responsible for preparation of River Basin Management Plans (RBMP) in accordance with the Water Framework Directive. These documents will be a critical source of information for spatial planners considering the flood risk implications of new development. However, they have not yet been published in final form.

Mersey Estuary Management Plan

4.1.29 The Mersey Estuary Management Plan (MEMP) aims to ensure that any human development or activity does not upset the natural processes in the study area.

4.1.30 There is comment in respect of the Project within the MEMP. It notes that "the planning for the New Mersey Crossing between Runcorn and Widnes demonstrates how the MEMP has been used: numerous studies and evaluations have been carried out to assess the impact of the crossing on everything from habitats and ecosystems, hydro- and sediment dynamics, air pollution and surface water quality, to cultural heritage and the economic development of the immediate and wider areas. Computer modelling has been used to predict the effects of the new bridge."

Regional Flood Risk Appraisal

4.1.31 Regional flood risk appraisal is a component part of the Regional Spatial Strategy plan. It is currently only in draft form, but is expected to be adopted in August 2008.

Local Policy

The Unitary Development Plan (UDP) for Halton Borough Council

4.1.32 The UDP is the Council's local plan for development. It was adopted in April 2005 and is saved under the Planning and Compulsory Purchase Act 2004 (PCPA) until 2011. The requirement of the UDP is that any applicants for planning permission in flood zone areas require a flood risk assessment in accordance with PPS25.

4.1.33 The Project is part of Strategic Policy S14 of the UDP. Justification for the scheme is given as the means to relieve congestion on the existing Silver Jubilee Bridge as part of an integrated transport system for Halton and the wider region.

4.1.34 The Council is currently preparing new planning documents that will form their Local Development Framework (LDF), which will eventually replace the UDP. A key document that will form part of the LDF is the current Strategic Flood Risk Assessment (see 4.1.36).

Strategic Flood Risk Assessment (SFRA)

4.1.35 The SFRA for Halton has been undertaken to provide a detailed and robust assessment of the extent and nature of the risk of flooding in Halton and its implications for spatial planning. The main objectives of this SFRA are to:

a. Identify land at risk of flooding in Halton and the degree of risk from river, sea and other sources;
b. Reduce flood risk from and to new development through promotion of appropriate location, design and mitigation measures;
c. Inform policy formulation and the Sustainability Appraisal for the emerging Local development framework concerning land use in flood risk areas;
d. Provide a framework for development control officers and developers for dealing with the flood risk in development.

4.1.36 The Project specific FRA has incorporated the outputs of the SFRA. The SFRA recommends inter alia that:

a. Every application for development or change of land use must be considered in terms of its potential to flood risk;
b. Relevant PPS25 guidance should be used to test whether the land is suitable for the development and, if so, whether a site specific FRA is required;

4.1.37 The SFRA did not comment on specific issues of flood risk from the Project as, at the time of production, no final route had been decided.

4.1.38 The Council's SFRA was published in October 2007 and provides guidance on the preparation of policies and proposals in the Local Development Framework to a standard that will meet the EA's requirements. The Project is referred to in the SFRA within 'Other Development/Regeneration Priorities – Transport', but makes no specific reference to flood risk as, at the time of SFRA compilation, the route of the highway had not been finalised. Instead the SFRA defers to the site specific FRA.

Other Local Documents

4.1.39 The Widnes Waterfront Development provides no comment on flood risk.

4.1.40 The Ditton Strategic Rail Freight Park makes no comment about the Mersey gateway or flooding and will not affect the proposed scheme.

4.2 Policy Justification

4.2.1 Chapter 6 of the ES undertakes a detailed assessment of the Project against the relevant European, national, regional and local planning (and transport and economic) policy framework. It identifies where policies have either a statutory or non statutory status and has regard to emerging policy as appropriate.

4.2.2 The Mersey Gateway Project has been assessed against adopted and emerging national, regional and local planning policies. Policies and plans have been considered for the period up to 2021 concluding with the plan period of the emerging Regional Spatial Strategy for the North West.

4.2.3 The evolving nature of the planning system means that new policy documents will emerge and gain weight and status over the life of the Project. This will require the ongoing monitoring of planning policies at each strategic level as new policy documents emerge and are adopted by the relevant bodies. This will include the Halton Local Development Framework. These documents, as they emerge, may have a direct impact upon the Project, and as such will continue to be monitored following the submission of the EIA. This will serve to ensure that any future policy requirements are identified and satisfied where this will deliver environmental, social and economic benefits.

4.3 Roles and Responsibilities

4.3.1 Responsibility for the management of flood risk falls within the remit of a number of bodies as set out in paragraphs 22-32 and Annex H of PPS25. For convenience, the roles of the key parties are outlined briefly below.

4.3.2 Landowners have the primary responsibility for draining their land and managing the flood risk issues associated with their property. Landowners proposing development are required to:

a. Demonstrate that the proposal is consistent with PPS25 policy and those on flood risk in the Local Development Documents;
b. Provide a site specific FRA that demonstrates (i) the affect of current and future flooding, (ii) that the development is safe, (iii) that it does not increase flood risk elsewhere, (iv) that measures will be put in place to manage effects and risk;
c. Reduce flood risk to the development and elsewhere by incorporating sustainable drainage and resilient construction;
d. Identify opportunities to reduce flood risk, enhance biodiversity and manage flood risk.

4.3.3 The owners of assets such as canals and reservoirs are similarly responsible for managing the flood risk issues associated with them.

4.3.4 Spatial planning is the responsibility of the regional and local planning bodies. The PCPA and accompanying regulations require regional planning bodies and local planning authorities to produce spatial plans in the form of Regional Spatial Strategies and Local Development Documents. These should provide for the management of flood issues.

4.3.5 The EA and other flood and coastal defence operating authorities, including local authorities and Internal Drainage Boards, have statutory powers to manage flood risk to existing properties and assets. The EA prepare strategic plans for measures to reduce flood risk posed to existing communities and assets by rivers, watercourses and the sea, in accordance with policies developed by the Department for Environment, Food and Rural Affairs (DEFRA).

4.3.6 Sewerage undertakers are responsible for any sewers adopted under the requirements of the Water Industry Act 1991. Responsibility for the maintenance of highway drainage systems lies with the highway authority wherever these are not privately owned.

5. CONSULTATION

5.1 Introduction

5.1.1 The following section sets out the consultations undertaken with regulatory bodies in the course of compiling this FRA. Gifford approached the bodies for information and advice on what should be included in the FRA. The effect of the comments and guidance received were adopted in the assessment of flood risk at baseline and for the project.

5.1.2 The three main consultees are: the EA, the Council and United Utilities North West (UU).

5.1.3 The EA was consulted because they hold the majority of flood risk information and are statutory undertakers of main rivers (main rivers are rivers designated under the WRA.) in the study area. The EA will be statutory consultees in the assessment of the FRA in the planning process.

5.1.4 The Council was consulted because they are responsible for the ordinary watercourses (ordinary watercourses are watercourses that are not main rivers.). The Council, as local highway authority, also has records of highway drainage because they maintain of the Borough's highway network.

5.1.5 UU was approached to identify the existing capacity of public sewerage, and to identify any flooding caused by public sewerage. UU has also been contacted regarding the connection of foul water from the Project's toll plazas to public foul water sewerage.

5.2 Environment Agency

5.2.1 The first meeting with the EA was in October 2006. In this meeting discussion was centred on the boundaries of drainage for the Project. Among the subjects discussed were discharging at Greenfield rates, attenuation of flows and the storage of runoff up to and including the 1% rainfall event, plus an additional 20% volume to take into account climate change.

5.2.2 Discussion also included where surface water runoff should be allowed to discharge. The EA advised that if discharge was made into Stewards Brook then it must be restricted to equivalent Greenfield rates. Should discharge be made to a canal then consultation would be needed with the owner of the canal.

5.2.3 The EA stated that there was no flood risk associated with the St Helens Canal.

5.2.4 Information was acquired from the EA regarding flood zones, historical flooding data, and JFlow levels (JFlow is the EA's hydraulic computational modelling software that is used to establish flood zones).

5.2.5 A subsequent meeting with the EA was held in September 2007. This was a progress meeting to discuss design progress of the Project and the emerging drainage strategy. The meeting also asked if there was any further information regarding flooding in the Study Area. The meeting reviewed various topics including watercourses and Greenfield runoff rates. A methodology for assessing flood risk based on a comparison of flood levels with contour plans of the existing land use and of the Project was agreed.

5.2.6 The watercourses discussed at the meeting included Flood Brook, in relation to which the EA was unaware of flooding. The EA did not hold any information on the brook.

5.2.7 It was agreed that the possible culverting of Halton Brook (replacing an open channel with an underground piped channel) would be feasible, provided that a degree of ecological benefit could be established nearby. It was also agreed that the discharge of attenuated highway runoff water to the brook was acceptable.

5.2.8 It was suggested at the meeting with the EA in September 2007 that the proposed balancing ponds at the Widnes Loops junction would discharge into Bowers Brook. The EA was not aware of the fluvial characteristics of the brook and so requested that a hydraulic survey of the brook would be required if this drainage strategy was proposed. The EA advised that an easement of 8m would be required on either side of the culvert section of Bowers Brook to facilitate future inspection and maintenance of the brook.

5.2.9 In response to asking whether it was acceptable to discharge into Stewards Brook the EA suggested that there must be betterment to the existing situation. This could be achieved by implementing SUDS strategy to the highway runoff from the main toll plaza area (Construction Area A).

5.2.10 The EA requested that in terms of runoff the mean Greenfield rate would be accepted rather than variable rates. This was a technical requirement of the EA, essentially requiring a fixed rate of discharge from a runoff attenuation system rather than a variable rate.

5.2.11 It was agreed with the EA that the proposed methodology for this FRA would consist of using EA data and topographical surveys to show the different 'existing and after' scenarios for flood depths and the determination of flood storage following development.

5.2.12 The EA advised that data currently available should be used in the absence of any other flood data. The EA also advised that tidal and fluvial sources could be used but that the detailed design should consider the combined fluvial and tidal effect.

5.2.13 The last meeting with the EA was held on in February 2008. This meeting was used to update the EA on the further development of the Project, and to review draft versions of the written drainage strategy and flood risk assessment reports.

5.2.14 Gifford provided an overview of the timeline of the planning process, and a review of the current Project split into different areas based on the general arrangement drawings. The sections were St. Michael's Road to Ditton Road, Ditton Road to MSC, MSC to Bridgewater Junction, Bridgewater Junction to Weston Link Junction, M56 Motorway Junction 12 and the SJB de-linking.

5.2.15 In relation to the section of St Michael's Road to Ditton Road it was suggested that discharge should be restricted to Greenfield rate and attenuation up to and including 1% rainfall event plus climate change. Discharge would be made to Steward's Brook. The EA confirmed this was acceptable.

5.2.16 For Ditton Road to MSC: Gifford advised that the proposed highway runoff would discharge in to the St Helens Canal, rather than in to Bowers Brook. It would use a swale, rather than a balancing pond. The EA could see no problem in principle with this approach.

5.2.17 It was agreed to allow Bowers Brook to remain in open channel and amend the canal-side road design.

5.2.18 In relation to the MSC to Bridgewater Junction: the EA was hopeful that Halton Brook might be remain unculverted. The Project is due to be elevated above the brook which could restrict future EA operations at the brook. The EA suggested that the brook is moved to a position alongside the Project's boundary.

5.2.19 There were few comments made by the EA in relation to the section between Bridgewater Junction to Weston Link Junction save in respect of the differences between the areas of existing impermeable and new impermeable areas. This comment applied to the entire scheme. It was suggested that a table is presented that provides the 'before and after' surface areas of highway, which would give a clearer indication of runoff rate.

5.2.20 Gifford stated that the SJB will be re-decked. However there would be no difference between the existing drainage and the proposed drainage as the surface area would be identical.

5.2.21 Overall the Environment Agency was generally supportive of the drainage scheme and the FRA and for saw no significant problems with the scheme.

5.3 The Council

5.3.1 Gifford had two meetings with the Council. Both were used to discuss the emerging drainage strategy of the Project. The first meeting was held in September 2007 with the purpose of reaching agreement in principle to the discharge of surface water runoff from the Project to existing highway drainage infrastructure.

5.3.2 In summary, the Council was informed that increased level of highway runoff from the New Bridge and the main toll plaza area (Construction Areas A, B and D). The drainage requirements at other areas of the project were understood to be less than the existing carriageway in those area.

5.3.3 It was agreed that existing highway drainage would be able to accept runoff from the Project if it could be demonstrated that runoff flow rate is less than the existing flow rate. The majority of the junction alteration works should comply with this requirement.

5.3.4 The Council pointed out that combined kerb and drainage systems (such as Beany® Blocks) should be kept to a minimum. This is because the maintenance of such systems can be problematic and relatively time consuming.

5.3.5 Where there is an increase in surface water runoff, when compared to the existing highway, the Council advised that flow attenuation would be necessary. Balancing ponds were proposed at five locations: two ponds for the proposed location of the main toll plaza, two ponds at Widnes Loop Junction and one pond at Astmoor junction

5.3.6 The Council advised that much of the land on which the Project would be built is contaminated, particularly around the main toll plazas on the golf course.

5.3.7 The Council advised that there were existing highway drainage problems at Marsh Brook and at St Michael's Road. It was agreed that the proposed drainage for the project should not impact upon these sites.

5.3.8 A second meeting was held in February 2008 to update the Council on the Project's drainage strategy. An overview of the Project was made, dividing the route into sections. The sections

were St Michael's Road to Ditton Road, Ditton Road to MSC, and Bridgewater Junction to Western Link Junction.

5.3.9 The meeting heard that the St Michael's Road to Ditton Road section could experience ground settlement at the golf course; minor flooding was experienced at Ditton due to the apparent under capacity of the culvert beneath Ditton Road; and Marsh Brook has known flooding problems. It was agreed that the Project's discharge in to Stewards Brook would have no effect on the flood risk for these areas.

5.3.10 The Council would provide the areas of known flooding to Gifford for information. It also agreed to provide information relating to existing drainage at Lodge Junction and the Central Expressway between Bridgewater Junction and Lodge Junction.

5.4 United Utilities North West

5.4.1 UU provided extracts from the public sewer records for the Study Area.

5.4.2 UU has also advised Gifford on the capacity of existing public sewers within the Study Area. It is understood that the existing surface water sewers within the Study Area run at full capacity during heavy rainfall events. Although running at capacity, it is further understood that there are no reported incidents of flooding from public surface water sewerage in the study area.

5.4.3 Gifford has also advised UU that proposed foul water from the toll plaza welfare facilities will be discharged into existing foul water sewerage.

6. ASSESSMENT METHODOLOGY

6.1.1 The potential impacts of the Project on flood risk have been assessed with regard to relevant tests provided in national legislation and, where relevant, in national, regional and local policies. Flood risk will be assessed from river and tidal systems and from other sources.

Flood Risk – River and Tidal

6.1.2 An assessment of the risk of flood of the existing land use has been made by reference to the EA's indicative flood maps. These maps have been also be used to appraise flood risk associated with the Project. A comparison has been made between the current and the projected flood risk and how this is affected by the Project. Consideration of flood risk during the temporary works phase of construction has also been made.

Flood Risk – Other Sources

6.1.3 An assessment of the risk of flooding from other possible flood sources, including from groundwater, surface water, highway drainage, watercourses and public sewerage, has also been made. The current risk of flooding from each source has been assessed upon the existing and proposed landuses. This has then been compared to theorised risks associated with the Project.

Surface Water Drainage

6.1.4 The current design of highway drainage has been reviewed and existing flow routes to existing watercourses identified together with other drainage routes, such as, public sewers and highway drains. The means of controlling the rate of highway surface water runoff has also been considered.

Baseline Methodology

6.1.5 The methodology involved in undertaking the assessment of the baseline conditions is as shown within this section:

Flood Risk - Existing Landuse

a. Topographical information of existing landuse has been obtained;
b. Flood level data from EA and other responsible bodies has been obtained;
c. Flooding data from reported and anecdotal sources has been obtained through meetings with statutory bodies;
d. A review has been undertaken of current impact (area, severity, consequence, mitigation) of flooding by various sources of water upon existing landuse.

6.1.6 The methodology for undertaking the assessment of the effects of the Project is as follows.

Flood Risk - Proposed Landuse

a. A review has been undertaken of the proposed highway and bridge layout, including on and off embankments;
b. A review has been undertaken of areas of the Project that fall within existing flood zones;
c. The predicted impact of existing flood risk upon the Project has been quantified;
d. Areas that might realise an increase or decrease in flood risk have been identified.

Surface Water Drainage

6.1.7 An outline scheme of highway drainage for all sections of the Project has been prepared. Outfalls from individually drained sections of highway will discharge to either:

a. An existing body of water; or
b. An existing highway drainage system.

6.1.8 Consultation with the EA, the Council and with the sewerage undertaker (United Utilities North West) has been undertaken in order to understand each of their requirements and to implement an effective highway surface water runoff proposal.

7. BASELINE AND RESULTS OF INVESTIGATION

7.1 Baseline Information

7.1.1 The following data examines the baseline scenario, i.e. the existing situation with respect to flooding and flood risk, in order to allow a better understanding of changes caused by the Project.

Flood Map

7.1.2 The EA provides a web-based Indicative Flood Map (IFM) of England and Wales. The IFM and associated information is intended for guidance only as it represents the general extent of flood risk. The flood zones shown correspond to those defined in Table D1 of PPS25 as Zone 2 (Medium Probability) and Zone 3 (High Probability and functional floodplain). The EA website can be accessed at www.environment-agency.gov.uk.

7.1.3 The IFMs show current best estimates of the risk of flooding from rivers and the sea only and does not consider other sources. They take no account of potential climate change impacts. Nevertheless the maps do provide an indication of flood risk. They also show areas at risk but protected by flood defences. The IFM for Zones 2 and 3 for the study area are shown in Appendices B and C respectively.

Flood Risk

7.1.4 The IFMs delineate with colour Flood Zones 2 and 3. The lower risk zone, Flood Zone 1, is then the balance of the Study Area outside Zones 2 and 3. The three different flood risk zones are described in Table D.1 of PPS25. A brief summary of the characteristics of each flood zone is shown in Table 7.1 below.

Zone 1: Low Probability
Land in this zone has been assessed as having less than 1 in 1000 chance of river or sea flooding in any year (< 0.1%).
Zone 2: Medium Probability
Land in this zone has been assessed as having between a 1 in 100 and 1 in 1000 chance of river flooding in any year (1% and 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-0.1%) in any year
Zone 3a: High Probability
Land in this zone has been assessed as having a 1 in 100 or greater chance of river flooding in any year (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.
Zone 3b: The Functional Floodplain
Land in this zone is used for water flow or storage in times of flood. Strategic Flood Risk Assessments (SFRA) should identify this zone (land which would flood in an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1%) flood, or at another probability to be agreed between the LPA and EA, including conveyance routes).

Table 7.1: Classification of Flood Risk Zones (from PPS25 Annex D)

7.1.5 The EA IFMs reveal that the Project lies within Flood Zones 1, 2 and 3. For development within Zones 2 and 3 the PPS25 recommends the application of the Sequential and Exception Tests at all stages of the planning process with the aim to steer new development to areas of lower probability of flooding.

7.1.6 Further to Table D.2 of PPS25 the Project may be classified as 'Essential Infrastructure' with respect to flood risk vulnerability. This classification is described further in PPS25 as 'essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk'.

7.1.7 Table D.3 of PPS25 combines flood zone classification and vulnerability classification in a matrix. The matrix is used to determine whether certain types of development should be built in respective flood zones. According to Table D.3, Essential Infrastructure, such as the Project, can be built in Flood Zones 2 and 3 subject to the application of the Sequential and an Exception Test. These tests are presented in Section 7.4.

7.1.8 The IFMs delineate with colour Flood Zones 2 and 3. The lower risk zone, Flood Zone 1, is the remaining area outside Zones 2 and 3. The three different flood risk zones are described in detail in Table D1 of PPS25 and earlier in this report.

EA Flood Zone Classification

7.1.9 The EA have provided information on the flood zone classification for the different sections of the Project within the study area, shown in Appendices B and C. It can be seen from this information that the majority of the proposed alignment of the Mersey Gateway is located within Flood Zone 1.

7.1.10 There is a stretch of the existing highway that is within Flood Zones 2 and 3. The Project, as it essentially follows the alignment of existing carriageways, would also be located within the same Zones. The Flood Zones extend to comprise the following areas within Construction Areas C and D:

a. Catalyst Trade Park
b. A557 Road (near Catalyst Trade Park)
c. St Helens Canal
d. Bowers Brook
e. Widnes Warth (Saltmarsh)
f. Astmoor Saltmarsh

Historical Flooding

7.1.11 The EA have provided information on historical flooding within the study area. This is shown within Appendix B. Flooding is shown on this map to be limited to an area along Ditton Brook at the Ditton Marsh. This area is to the south of the existing A562 Speke Road, and will be outwith the footprint of the Project. The EA have not provided any information with regard to the severity of this flood event.

7.1.12 Discussions with the Council confirmed that the Ditton Brook area has flooded in the past, and continues to provide drainage problems. The Council has identified that a combination of circumstances caused by seasonal high tides, silt deposits within the watercourse, and relatively large volumes of flow entering Ditton Brook can cause flooding at this location.

7.1.13 Information contained within the EA's Mersey Estuary CFMP suggests there has been concern about flooding from the River Mersey between Manchester and Warrington in the historic context. However, this is much further upstream from the Project and outwith the Study Area. Until the MSC was built in 1894, the Mersey caused frequent and extensive flooding. According to the CFMP there has been no recorded flooding in Warrington as a result of fluvial events since the construction of the Canal.

7.1.14 The EA also notes in the CFMP that tidal flood risk remains the main issue for the downstream reaches of the River Mersey. The most recent tidal flooding event occurred in February 1990. Tidal water levels flowed up the Mersey Estuary and into Warrington. Water overtopped the existing defences in Warrington and threatened properties in the central area.

EA Flood Defences

7.1.15 The EA has provided information on the location of flood defences for watercourses within the study area. These are shown in Appendix C and are sited along Bowers Brook, Ditton Brook and Stewards Brook.

7.1.16 Information on the type of defence, and the structural integrity and life expectancy of defences and level of protection provided by these flood defences has not been provided by the EA. From the information gathered during site visits it is known that the flood defences associated with the open section of Bowers Brook (through Widnes Warth saltmarshes) comprise of relatively low level earth embankments.

7.1.17 Information within the SFRA indicates that the only area in Halton with raised flood defences is at Ditton Brook. These defences have a standard of protection of 1 in 100 years. The height of the defences above ground level is only 500mm.

7.1.18 Within the Study Area there are no flood defences indicated by the EA on the south bank of the Mersey.

Climate Change

7.1.19 Guidance available in PPS25 recommends the allowances for the net sea level rise due to the effects of climate change to be added to the above extreme tidal flood levels. Table B.1 of PPS25 (reproduced below as Table 7.2) identifies a recommended contingency allowance for net sea level rise of up to 13mm per year for the 100-year life expectancy of the Project.

Table B.1 Recommended contingency allowances for net sea level rise

Administrative Region	Net Sea Level Rise (mm/yr) Relative to 1990			
	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
East of England, East Midlands, London, SE England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South West	3.5	8.0	11.5	14.5
NW England, NE England (north of Flamborough Head)	2.5	7.0	10.0	13.0

Table 7.2 – Extract from PPS25 Annex B

7.1.20 The allowance for climate change for the Project has been calculated. Following the guidance within PPS25, and assuming a 100 year asset life to the year 2115, the allowance is comprises 35 years @ 2.5mm/year plus 30 years @ 7.0mm/year plus 30 years @ 10.0mm/year plus 30 years @ 13.0mm/year. This sum total of this calculation equals 988mm. This value can be written as 0.99m when represented to two significant digits, which is consistent with dimensions provided throughout the FRA.

Fluvial Flood Levels

7.1.21 The EA has provided information on the 1 in 100 year and the 1 in 1000 year fluvial flood levels for Bowers Brook, Ditton Brook and Stewards Brook. The fluvial flood levels are shown in Appendix D.

7.1.22 The fluvial flood levels provided by the EA do not take into account allowances for the effects of climate change. An allowance for climate change has been made based on the calculation presented at 7.1.20 (above). Fluvial flood levels at locations along the proposed alignment within the EA Flood Zones 2 and 3 are shown in Table 7.3 below:

Location	Construction Area (see Fig 3.4)	Fluvial 1 in 100 year flood level (m AOD)		
		No allowance for Climate Change	With allowance for Climate Change	Level difference (m)
Catalyst Trade Park	C	7.88	8.87	0.99
A557 Road (near Catalyst Trade Park)	C	7.90	8.89	0.99
Bowers Brook	C	7.88	8.87	0.99
St Helens Canal	C	7.88	8.87	0.99
Widnes Warth Saltmarsh	D	7.91	8.90	0.99

Table 7.3: EA Fluvial Flood Levels without climate change and with climate change to year 2115

Tidal Flood Levels

7.1.23 Copies of the following reports have been obtained from the EA:

a. Coastal Flood Risk Mapping, Summary Report, Posford Duvivier Mott McDonald Consortium (PDMM), July 2001.
b. Strategic Review of Flood Risk in Warrington, Extreme Tidal Analysis, Final Report, EA, May 2007.

7.1.24 The PDMM Report presents methods and calculations used to derive flood risk maps for the EA North West Region. The area studied in that report comprised the northwest English coastline between Scotland and Wales, extending from Gretna on the Solway Firth to Burton Point on the Dee Estuary.

7.1.25 The extreme tidal profile of the River and the corresponding tidal flood levels are also detailed within the PDMM report. Water levels have been derived at 1km intervals along the coast and up the Estuary to provide 1 in 200 year water levels.

7.1.26 Within the PDMM report the 1 in 200 year extreme tidal flood level at the Study Area is noted to be 7.31m AOD, and the 1 in 1000 year extreme tidal flood level is 7.61m AOD. The levels do not take account of sea level rise associated with climate change.

7.1.27 The more recent Strategic Review of Flood Risk in Warrington (May 2007) provides updated levels for the Extreme Tidal flood levels between Fiddlers Ferry and Woolston Weir, both being points upstream of the study area. The 1 in 200 year tidal flood level at Fiddlers Ferry is 7.64m AOD. This is approximately 160mm greater than the corresponding level noted within the PDMM report.

7.1.28 Based on the May 2007 report the corresponding 1 in 200 year Extreme Tidal Flood Level within the study area is 7.55m AOD. This value is adopted in this FRA as it is the product of recent analysis methods and understanding. Again, no account of climate change has been made.

7.1.29 The allowance for climate change, based 7.1.20, the corresponding 1 in 200 extreme tidal flood level is 7.55m AOD plus 0.99m which equals 8.54m AOD for the year 2115 (assuming an asset life of 100 years).

Combined Fluvial and Tidal Flood Levels

7.1.30 Information from the CFMP indicates that the proposed study area does not lie within the combined Fluvial and Tidal 1 in 100 year flood event.

7.1.31 The EA has confirmed that the examination and identification of combined fluvial and tidal events would not be required as part of this flood risk assessment (see section 5.2).

Flood Risk from Watercourses

7.1.32 Each watercourse is hereafter taken in turn and examined for its existing flood risk issues.

Ditton Brook

7.1.33 Ditton Brook is located approximately 500m to the south west of the former St Michael's Golf Course. It flows in a south-easterly direction into the River Mersey. This watercourse is classed as a Main River by the EA. Ditton Brook does flood, primarily due to tide-lock (high tides prevents fluvial discharge), although the frequency of flooding is not known. The flood plain of the brook is outside the boundaries of the study area. The flood area extends to an area in Hale Bank and to the south of the A562 highway.

Stewards Brook

7.1.34 This watercourse is classed as a Main River by the EA. It flows in a southerly direction through the former St Michael's Golf Course and is a tributary of Ditton Brook. Sections of the brook, to the north of the A562, are in culvert. Stewards Brook passes under the highway through the golf course via a culvert. The culvert may present a flood risk to neighbouring land, but there has been no historical evidence of the road flooding from Stewards Brook. The flood level for the 1% flood event is approximately 7m AOD. The A562 carriageway is at approximately 13m

AOD and is at no risk of flooding; the Ditton Road is approximately 7m AOD and is at risk of flooding. The surface water from highway runoff eventually discharges into Stewards Brook. This is unrestricted discharge and in times of high rainfall, this surface water will increase flow within the brook and hence a heightened risk of flood will result. There is no provision for pollution control within existing highway drainage.

7.1.35 The culvert through which Stewards Brook flows beneath Ditton Road is of insufficient capacity and flooding has been recorded by the Council on this road. Any increase in flow to the brook is likely to exacerbate this problem.

Marsh Brook

7.1.36 Marsh Brook flows from the north of Widnes, and passes through the study area in culvert. The brook then flows in an open section into the Mersey Estuary. The Project does not cross the brook.

Bowers Brook

7.1.37 Bowers Brook is culverted along most of its length. It flows from the north of Widnes to the Mersey Estuary, passing through several industrial sites. It splits into two legs near its point of outfall - one leg flows parallel to the St Helens Canal, outfalling near the canal's terminal lock, the other leg outfalls through Widnes Warth salt marsh. The watercourse is classed as Main River by the EA. The Project will cross Bowers Brook twice, first by the St Helens Canal and then over the saltmarsh.

7.1.38 The existing highway surface water drainage does not discharge into Bowers Brook, instead outfalling to Marsh Brook through an array of highway drains. The existing road does not cross Bowers Brook and there is no risk from fluvial flooding to the existing highway.

7.1.39 The flood level for the brook, next to the St Helens Canal, is 8.87m AOD in the 1% fluvial flood including allowance for climate change. This level would inundate the Catalyst Trade Park.

St Helens Canal

7.1.40 The St Helens Canal links the town of St Helens with the Mersey Estuary at Widnes. The canal is currently not trafficked by craft, and there is minimal flow of water within the Widnes section. The canal is located alongside the northern bank of the Mersey Estuary bordering the salt marshes. The canal terminates with lock gates at Spike Island.

7.1.41 There is no known risk of flood from St Helens Canal to the existing road according to the Council. The canal is not part of a live system whereby its level is maintained by high level reservoirs. Instead it receives flow from Fiddlers Ferry Power Station, and is reported by the Council to be losing water through leakage. The canal is built into the ground, therefore if the walls breach there will be no effect.

Upper Mersey Estuary

7.1.42 Upper Mersey Estuary is a tidal river that flows in a westerly direction towards Liverpool Bay. The estuary has an unusual bottle-shaped platform, with a narrow deep entrance channel opening into a shallow wide inner basin of shifting banks and channels, which in turn leads to a meandering river stage further landwards.

7.1.43 The existing risk to the area from the River is of tidal flooding. The existing risk is minimal for the SJB due to its height above the river. The surface water drainage for the SJB and approach spans discharge into the Mersey. This surface water is unrestricted and offers limited pollution mitigation. It may have an impact on local flood risk.

Manchester Ship Canal

7.1.44 The MSC connects Woden Street Bridge in Manchester with the tidal channel of the Mersey Estuary at Eastham Locks. Within the study area the MSC flows alongside the southern banks of the Mersey Estuary, in parts bordering the salt marshes and in parts the estuary itself. The MSC is still actively used for commercial shipping activities. It is owned and operated by the Manchester Ship Canal Company.

7.1.45 The MSC behaves as a flood defence barrier, protecting the River Mersey from excessive flow. This in turn means that the water can rise and fall in the MSC. The MSC has no effect on the existing road as it crosses the canal significantly above water level.

7.1.46 Information within the SFRA provides commentary on the MSC. It states that water levels in the MSC within Halton are affected by four factors:

a. Water flowing down the River Mersey from the upper reaches of the canal, above Latchford Locks.
b. Water flowing down the canal from Latchford Locks.
c. Water flowing down the River Weaver.
d. Tidal events.

7.1.47 The MSC has a series of weirs and sluices that regulate flow and hence water levels within the canal.

7.1.48 The MSC Company confirm, according to the SFRA, that there are no known procedures undertaken by the MSC Company that could create a risk of flooding as far as is known. Further, the MSC Company have no records of flooding from any source in Halton or of any other flood events within the Borough.

Runcorn to Latchford Canal

7.1.49 There is only a 500m section remaining of the Runcorn to Latchford Canal. It is located wholly within the study area on Wigg Island. It is understood that this canal is currently disused.

Halton Brook

7.1.50 Halton Brook flows in a northerly direction, passing through Runcorn to its outfall into the MSC within the Astmoor Industrial Estate. The majority of the brook has been culverted during the urbanisation of Runcorn. Few open sections of the brook exist within the study area, and limited discharge from this brook has been observed to flow into MSC.

Bridgewater Canal

7.1.51 The Bridgewater Canal is 65km in length and connects Worsley, near Manchester, and Runcorn. This canal links a number of other canals in the northwest of England. The canal is jointly owned and operated by the Manchester Ship Canal Company and the Bridgewater Canal Trust.

7.1.52 The Bridgewater Canal has no effect on the existing highway as the canal terminates before reaching the existing road.

7.1.53 However the existing road has an effect on the Bridgewater canal. This is a discharge into the Bridgewater canal, this discharge is unrestricted and will increase flows in times of heavy rainfall.

Flood Brook

7.1.54 Flood Brook flows southwest from Runcorn and through a culvert immediately north of the M56 Junction 12. The brook then flows under the Weaver Navigation Canal and discharges into the River Weaver. The River Weaver outfalls into the MSC. The River Weaver is outside of the study area.

7.1.55 Existing sections of highway currently discharge to the brook. The Council is not aware of any flooding issues associated with this arrangement.

Flooding from other sources

Flooding from Land

7.1.56 The existing road around Stewards Brook cuts the brooks catchment in half. In intense rainfall events this could exacerbate flooding in the field north of the road. However there is no evidence this has never happened.

Flooding from Groundwater

7.1.57 There is no known groundwater flooding problems within the study area. The CFMP suggests that rising groundwater may cause problems in the future, however, it is not perceived that the proposed scheme exacerbates risk or prevents any future remedial actions.

Flooding from Sewers

7.1.58 United Utilities North West (UU) has stated that their public surface water sewerage network is at capacity during periods of heavy rain. Nevertheless UU has no knowledge of flooding from sewerage within the study area.

Water Quality

7.1.59 The study area for the surface water quality assessment has concentrated on the principal water bodies located within the extent of the planning boundary of the Project. These water bodies are entitled “controlled waters” by the EA and are listed below (from north to south):

a. Stewards Brook;
b. Bowers Brook;
c. St Helens Canal;
d. The Estuary (specifically the Upper Mersey);
e. Runcorn to Latchford Canal (the “Latchford Canal”);
f. Manchester Ship Canal;
g. Halton Brook;
h. Bridgewater Canal; and

i. Flood Brook.

Stewards Brook

7.1.60 Upstream of the Project, the most recent EA monitoring data indicates that Stewards Brook has an overall general quality assessment (GQA) of 'fairly good'. Water quality at downstream of the Project is of a considerably lower quality. The most recent monitoring data has water quality with a GQA of 'bad'.

7.1.61 These results indicate that the surface water quality upstream of the location of the Project is of chemically higher quality than that found downstream of the location of the Project. The marked difference between the water qualities at the two sample locations on Stewards Brook is most likely as a result of a combination of consented discharges and leaching of contaminants to surface waters from wastes buried below the former St Michael's Golf Course. This is discussed in the Contamination of Soils, Sediments and Groundwater Chapter of the ES (Chapter 14).

Bowers Brook

7.1.62 The most recent monitoring data indicates that Bowers Brook has an overall GQA of 'good' upstream of the location of the Project according to the information shown on the EA website.

7.1.63 Historically the water quality at two monitoring points located downstream of the Project appears to be variable, but some trends are apparent. Despite the high variability in measured concentrations, there are discernable trends in biological oxygen demand (BOD), with water quality improving before monitoring ceased at the two locations. The EA have stated that monitoring ceases when it becomes apparent that a trend has established or there is no further requirement to continue to sample the monitoring location.

St Helens Canal

7.1.64 The most recent monitoring data indicates that the St Helens Canal has an overall GQA of 'fair'.

7.1.65 At Carter House Footbridge a trend of improving water quality is indicated by increasing dissolved oxygen concentrations. In recent years the percentage oxygen levels show the waters to be supersaturated with values greater than 100%. Both pH and BOD values fluctuate over time, however, but there is little in the way of observable trends. Similarly, the sediment concentrations fluctuate over time, but no trends are apparent - concentrations which are generally low. The pH values shown in recent years are high, currently averaging around 8.5 annually.

The Estuary

7.1.66 Water quality at 'Runcorn Old Lock' is classified as having a chemical GQA of 'fairly good' and at ICI Wigg 'fair' in the 2004 – 2006 period.

7.1.67 Upstream of the study area the water quality at Randles Sluices and Fiddlers Ferry is classified as having a GQA of 'fair' in the 2004 – 2006 period.

7.1.68 Downstream of the study area recent monitoring data suggests that water quality has a GQA of 'fairly good'. There is little variation between the results of the two downstream sample locations.

7.1.69 Although overall water quality is slightly better downstream of the study area in comparison to upstream, there is very little material difference between the actual values as these lie at the upper end of one scale and the lower end of the next.

Latchford Canal

7.1.70 There is limited data for the Latchford Canal with data obtained from the Council. However, based on the mean ammonia value the Canal would have a comparable chemical GQA of grade 'E' which is 'poor'. This has been used as an indication of water quality within the Latchford Canal.

Manchester Ship Canal

7.1.71 The most recent monitoring data obtained from the EA for the Manchester Ship Canal indicates that the water quality has an overall GQA of 'poor'

Halton Brook

7.1.72 No analysis is required for Halton Brook because it is a dry watercourse. For this reason it has not been assessed as part of the surface water quality chapter as there is no water to affect.

Bridgewater Canal

7.1.73 The most recent monitoring data obtained from the EA for the Bridgewater Canal indicates that the water quality has an overall GQA of 'fair'.

Flood Brook

7.1.74 The extent of works at Flood Brook is restricted to works adjacent to the watercourse and discharge of routine road runoff. For the purpose of the assessment a conservative approach has been undertaken where it has been assumed that the watercourse is of 'good' water quality under the EA GQA grading system as no water quality data is available for the watercourse.

Summary

7.1.75 The assessment of water quality is required in the determination of drainage strategy. PPS25 requires that there is betterment where possible of the environment. An appropriate sequence of drainage techniques could be provided that would ensure that water discharging to a watercourse would not detrimentally affect that watercourse but attempts to improve its quality.

7.2 Geology

7.2.1 The Geology has been described based on the British Geological Survey (BGS) 1:50,000 scale, Solid and Drift editions, Sheet 97, Runcorn. The maps show the Study Area to be underlain by Quaternary Drift deposits overlying bedrock of the Triassic Sherwood Sandstone Group. The BGS 6" Sheets dating from 1912/1928 have also been consulted (Lancashire Sheets 114SE and 115SW and Cheshire Sheet 24NE).

Solid Geology

7.2.2 The Study Area is indicated to be underlain by bedrock strata comprising the Pebble Beds (PB), Upper Mottled Sandstone (UMS) and Keuper Sandstone (KS) of Triassic age. Underlying the Triassic strata at depth are the Lower Mottled Sandstones, Manchester Marl, and Collyhurst Sandstone of Permian age. The Permian strata unconformably overlie rocks of the Carboniferous age, which contain the productive Coal Measures of the Westphalian B Series.

7.2.3 The depth to bedrock underlying the route alignment on the Widnes side of the Study Area has been shown to be around 40m to 50m depth. However, the depth to bedrock on the Runcorn (south) side of the river is approximately 5m to 20m.

Drift Deposits

7.2.4 Glacial Till is indicated to overly the bedrock across much of the site. The till is Devensian in age. The till forms an extensive sheet in the area, which varies in thickness north and south of the river. North of the Mersey the glacial deposits are in the order of 30-50m thick, although they may be locally thickened within eroded channels in the bedrock surface. To the south of the Mersey the till is between 5m and 15m thick.

7.2.5 The glacial till is masked at the ground surface by superficial deposits of alluvium, particularly in the vicinity of the Mersey estuary. The deposits comprise marine and estuarine alluvium, which pass into fluviatile alluvium upstream in the Mersey valley and tributaries, beyond the site. The alluvial deposits are indicated throughout the study area, bounded to the north by an approximate line joining the St Helens canal, freight line and Ditton roundabout. South of the Mersey the MSC forms the boundary of the alluvial deposits.

Made Ground

7.2.6 The industrial development of the Runcorn and Widnes area has resulted in a legacy of largely contaminated made ground underlying much of the study area. Made ground is likely to be encountered near the surface throughout the Study Area. It is highly variable in both vertical extent and chemical composition and has originated from numerous sources. Recent redevelopment works, demolition and changes in land use have further complicated the made ground deposits.

7.2.7 Technical Report B4027/4/E/1002 (Contamination of Soil, Sediments and Groundwater) provides detail of the nature and extent of contamination across the site and identifies, where applicable, the implications of the contaminated made ground on the Project.

Summary

7.2.8 An understanding of the underlying geology is required in the determination of drainage strategy. Certain drainage solutions can encourage percolation of runoff into the ground, or require deep excavations to facilitate attenuation tanks. The drainage strategy for the Project would also take account of the ground contamination, avoiding where possible unnecessary excavation and eliminating transmittal routes of leachate to buried pipework.

7.3 Groundwater and Source Protection Zones

7.3.1 The Sherwood Sandstone Group is classed as a major aquifer. A major aquifer is defined by the EA as a highly permeable formation usually with a known or probable presence of significant fracturing. They are usually highly productive and are able to support large abstractions for public water supply and other purposes.

7.3.2 A Source Protection Zone (SPZ) has been identified between 2km and 3km north of the river estuary. SPZs are designated zones around public water supply abstractions and other sensitive receptors and are intended to protect groundwater resources from potentially polluting activities. Figure 7.1 presents an overview of the SPZs within the Study Area.

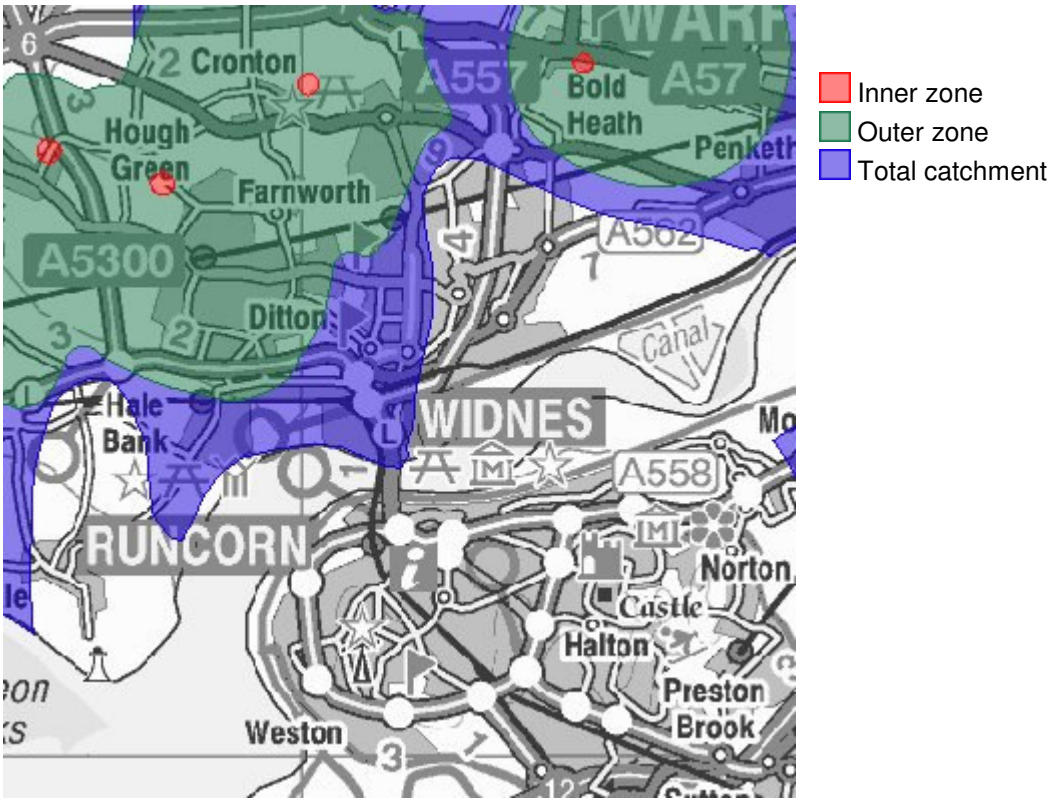


Figure 7.1 – Groundwater Source Protection Zones (Source: EA Website)

7.3.3 It is likely that perched groundwater exists at shallow depths within the alluvial deposits of the project area. These deposits and the localised water tables associated with them are likely to be in hydraulic continuity with surrounding watercourses, of which the most significant is the tidal estuary of the River Mersey.

Summary

7.3.4 An understanding of the groundwater and its vulnerability is required in the determination of drainage strategy. Certain drainage solutions can encourage percolation of runoff into the ground, and conversely allow groundwater to enter the drainage solution. North of the Estuary falls within the total catchment of an SPZ, this indicates that some drainage solutions that encourage groundwater percolation might not be suitable.

8. ASSESSMENT OF EFFECTS

8.1 Context

8.1.1 The New Bridge and the other aspects of the Project are key pieces of highway infrastructure that link into the existing principal road network. The Project's main objective is to relieve traffic on the existing SJB thereby removing constraints on local and regional development. With the Project in place there should be a consequential environmental enhancement, the creation of improved public transport links and the potential to encourage public cycling and walking.

8.1.2 The Project has been aligned to minimise land take and disruption caused by building demolition and landuse alteration. Its footprint has been designed to overlap that of existing highway routes as far as possible. Road junctions have been simplified by reducing the number of carriageways. Areas of new carriageway are restricted to the New Bridge, its respective approach sections, and that required to accommodate toll plazas.

8.1.3 This section identifies the effect that the Project would have on flood risk by comparing the existing highway layout with the proposed highway layout.

8.2 Flood Zones

8.2.1 The Flood Zones, as represented on the EA's indicative flood maps, coincide with the valley surface features of the existing watercourses, Appendices B and C refer. Ditton Brook, Stewards Brook and Bowers Brook all feature on the EA's Flood Zone 2 and 3 indicative maps. Both Flood Zones also occupy the fringes of the River Mersey – the saltmarshes of Widnes Warth in the north and Wigg Island in the south.

8.2.2 Whereas the majority of the existing road alignment is within Flood Zone 1, a section of the proposed highway falls within Flood Zone 2 and 3. These sections are explored further below.

Flood Zone 2 – See Appendix E

8.2.3 The plan area of Zone 2 is near coincident with that of Zone 3. There are minor variances only and for the purposes of this report they will be considered to cover the same area.

Flood Zone 3 – See Appendix F

8.2.4 There is a short 250m length of the existing A553 Queensway dual carriageway within Flood Zone 3. The A553 is an elevated dual carriageway and is above the present day flood levels of 7.90m AOD (fluvial 1 in 100) and 7.55m AOD (tidal 1 in 200).

8.2.5 According to the indicative flood maps, a Zone 3 flood would inundate the local roads of Macdermot Road, Desoto Road East and Wandsworth Way. The proposed highway does not affect these roads and so the flood risk here remains unaltered.

8.3 Flood Depth

8.3.1 The EA has advised that a comparison of the flood depths before and after the construction of the proposed road should be undertaken as part of this FRA. The comparison should comprise the 1 in 100 year fluvial and 1 in 200 year tidal flood levels, with and without climate change allowances. In order to carry out this exercise flood level information obtained from the EA was

combined with topographical information of existing landuse and proposed ground levels of the Project.

8.3.2 It has been possible to calculate the flood depths for the section of highway within Flood Zones 2 and 3. Detailed contour plans that identified the areas which could be affected by the fluvial 1 in 100 year and the 1 in 200 year tidal flood events, with and without the predicted effect of climate change, were constructed. The methodology used in calculating the actual flood depths at different locations involved calculating the difference between the existing and proposed ground levels, and the estimated flood depths within the flood zones taken from the contour plans.

8.3.3 The estimated flood depths before and after the proposed development are summarised in the Tables 8.1 and 8.2 below.

	Without Climate Change 1 in 100 year fluvial		**With Climate Change 1 in 100 year fluvial**	
	Existing	With Project	Existing	With Project
Flood depths (m)	0.25 – 2.50	0.25 – 2.50	0.25 – 3.50	0.25 – 3.50

Table 8.1: 1 in 100 yr Flood Depths – Before and After the Proposed Development

	Without climate change 1 in 200 year tidal		**With climate change 1 in 200 year tidal**	
	Existing	With Project	Existing	With Project
Flood depths (m)	0.25 – 2.00	0.25 – 2.00	0.25 – 3.00	0.25 – 3.00

Table 8.2: 1 in 200 yr Flood Depths – Before and After the Proposed Development

8.3.4 As can be seen from the above table there are no differences between the estimated flood depths before and the flood depths after the Project. The greatest flood depths are near the existing A557 Road and Hutchinson Street, near the Ditton Road junction, as the existing ground levels are lower than levels elsewhere within the EA flood zone. The flood depths along the proposed carriageway alignment will not be affected as they are above flood levels.

8.3.5 The results of the above assessment show that the fluvial and tidal flood depths at different locations would be the same whether or not the Project is constructed.

Proposed Highway – North of River Mersey

8.3.6 Sections of the proposed highway fall within a section of Flood Zones 2 and 3. A 700m length of highway, from near Victoria Road to the St Helens Canal, and a 800m length of highway over

Widnes Warth, are within these Flood Zones. The elevations of these sections rise from 18m to 25m AOD and are thus significantly above floodwater depths. Nevertheless the support structures and embankments of the highway and the slip roads, could be at risk of inundation should they be founded off ground that is beneath the respective flood levels.

8.3.7 The proposed Widnes Loops junction is wholly within Flood Zone 2 and 3. The junction permits entry to and exit from the New Bridge. Both slip roads terminate at tollbooths before joining existing local roads. The tollbooths are at a level of about 10m AOD. The westbound exit slip road drops from 18m AOD to 9m AOD, beneath the elevated carriageway, to connect to the northern tollbooth.

8.3.8 The eastbound carriageway from the southern tollbooth drops beneath the elevated carriageway to a minimum level of approximately 7.5m AOD before rising to join the elevated section. It is thus above the flood height.

8.3.9 Both tollbooths connect with the existing A557 Ashley Way highway at grade at its junction with the elevated railway line. The existing A557 north of the railway is within the Flood Zones.

8.3.10 A short section of the existing A553 Queensway dual carriageway (between SJB and Ditton Road Roundabout) is within flood Zone 3. This section is being removed. Much of it is on an embankment which would mean that there is less obstruction to flood water. This will be an improvement on the existing situation as the A553 road is an obstruction and could cause localise rising of flood levels. With the embankment removed local flood levels would be lower. With the removal of the embankment there would also be an increase in flood water storage in the floodplain meaning third parties are less likely to flood.

8.3.11 The Project would retain the existing Desoto Road West. This road is at a level of approximately 12m AOD and is thus above the flood level for both tidal and fluvial flood.

Proposed Highway – South Of River Mersey

8.3.12 The section of Wigg Island adjacent to the River Mersey is within Flood Zones 2 and 3. The proposed Highway crosses this section on piers. The finished road level here is in excess of 30m AOD and is therefore above flood levels.

8.3.13 There are no other sections of the proposed highway that would be constructed within Flood Zones 2 or 3.

Flood Storage/Loss of Floodplain

8.3.14 Construction of the proposed highway will remove a section of land from the Flood Zones due to construction of road embankment north of the River Mersey. The proposed highway will occupy a plan area within the Flood Zones that is larger than the existing highway's plan area. Consequently there will be a reduction of available floodplain storage estimated to be 2,300m^3 for a 1 in 200 tidal flood.

8.3.15 The effect on water levels due to this loss of flood volume is not significant. The volume available to a tidal flood within the Mersey Estuary is far in excess of that represented by land taken by the Project. There should not be any variation in flood risk due to loss of flood volume on the Project and on neighbouring property.

Flood Flow Routes

8.3.16 The ground within Flood Zones 2 and 3 and the study area will be re-profiled to facilitate the proposed highway's alignment. This would include the removal of certain existing structures and the construction of the permanent structures associated with the alignment. The majority of the proposed carriageway will be constructed outwith Flood Zones 2 and 3. Sections that fall within these Zones are either on elevated structures or on embankment.

8.3.17 Openings formed by structures or embankments can affect the rate of overland flow. The de-linking of sections of the A533 and the A557 carriageways south of Ditton Road will eliminate the narrow openings of Desoto Road East, Hutchison Street and Victoria Road. This would make these areas safer in times of flood due to a comparative decrease in the speed of overland flow caused by an increase in available area.

8.3.18 The Project will create new openings. Each new opening will be significantly wider than existing openings, because of structural members utilised, thus creating lower speed flows. This should increase personal safety during flood evacuation.

River Hydrodynamics

8.3.19 In the Hydrodynamic Study (Chapter 7), the effect of the New Bridge on tidal levels was considered. The computational hydrodynamic model used a particular bathymetry (under water depths) from the estuary as a starting bathymetry and then applied a spring-neap tidal cycle to this to assess morphological change over the period. The model generated a number of results, including water level. In addition to the spring-neap cycle, extreme tidal and fluvial events were modelled as part of the assessment.

8.3.20 The hydrodynamic model was used to model the response of the estuary to these various events, in each case both with and without the New Bridge in place. The differences between the results of these two model runs were then assessed. Amongst the differences assessed was that of water level. In terms of the effect on flood, it is the change of water level predicted at high tide water that is of interest. From the comparison of the extreme events with and without the New Bridge, the change in water level at high tide water is predicted to be 0.01m (i.e. 10mm).

8.3.21 The assessment of flood risk is the purpose of this FRA and such relevant matters as necessary have been drawn from the Hydrodynamics Study. Given the small predicted change in water level from the extreme event modelling of the estuary with the New Bridge, it is not believed that this has any material effect on the flood risk assessment given in this report.

Normal Tidal Range

8.3.22 For convenience, and in the interest of gauging an appreciation of flood levels, the expected tidal level variance has been gathered. At the Old Quay Lock, some 500m to the east of the SJB, the largest variance of the spring tide is from 0.9 to 6.4m; the smallest variance of the neap tide is from 0.9m to 2.5m. For the twelve-month period January 2005 to December 2005 the range observed at Widnes varied between 2.1m and 6.0m.

8.4 Flood Risk – During the Temporary Works

8.4.1 Temporary works employed during the construction of the proposed permanent works will require access to land within the flood risk zones. Adequate measures should be taken during

the design and execution of the temporary works so that fluvial and tidal flood risk is fully taken into account.

8.5 Flood Risk – Other Sources

Groundwater

8.5.1 Information reviewed within the Mersey Estuary CFMP report indicated that there is no documented evidence of groundwater flooding within the Mersey Estuary.

8.5.2 Information reviewed from the DEFRA commissioned study " Strategy for Flood and Coastal Erosion Risk Management: Groundwater Flooding Scoping Study Report, Jacobs, 2004", indicates that there are problems related with rising groundwater levels within Widnes due to changes in industrial water demand.

8.5.3 The "Groundwater Emergence" and "Mining Susceptible to Rising Groundwater" maps available within the DEFRA report have been reviewed for the study area. The maps indicate that the site does not lie within an area at risk of groundwater flooding from the aquifers or from past mining activities. The risk of groundwater flooding is therefore considered to be low.

Surface Water

8.5.4 Surface water flow generally occurs when excess surface water (not from a watercourse) runs off across land surfaces. Within the study area sources of surface water flooding could include impermeable areas such as highways, highway embankments, inadequate or blocked drainage systems and from tide-locks. Surface water flooding issues could be further increased with saturation of the ground caused by rising groundwater.

8.5.5 Discussions held to date with the EA and with the Council indicate that the study area is not prone to surface water flooding. The risk of surface water flooding is considered to be low.

Highway Drainage

8.5.6 The existing highway drainage array is a relatively simplistic arrangement of linear (spine) highway drainage. Roadside gullies discharge along a central spine drain to a low point whereby outfall is made to local watercourse, highway drain or public sewer.

8.5.7 From consultations with the EA and with the Council there is no flooding issue associated with highway drainage in the study area. There are reported instances of local highway flooding due to blocked roadside gullies. Effective maintenance of highway assets should prevent such flooding from occurring.

8.5.8 One flooding location outside the study area was noted, by the Council, at the junction of Ditton Road with St Michael's Road, outside the western periphery of the study area. Flooding here is thought to be attributable to insufficient capacity of highway drainage and the partial silting of the receiving watercourse. Local topography would suggest that flooding at this location would not affect the study area.

8.5.9 Inspection of existing highway drainage systems reveals that there is no water attenuation of highway runoff. There is essentially no buffering effect of water discharge from the highway and so discharges to watercourses comprise relatively high volumetric flow rates. As detailed in the Drainage Strategy in section 9, the proposed highway drainage would incorporate water

attenuation so that highway runoff would be released at a low flow rate over a longer period of time.

Watercourses

8.5.10 The watercourses within the assessment area affected by the Mersey Gateway are Stewards Brook, Bowers Brook and Halton Brook. From a review of available technical reports within the ES, and from consultations made to date, it is understood that these watercourses are not a cause of flooding.

Public Surface Water Sewerage

8.5.11 Gifford has been in consultation with the local sewerage undertaker regarding the capacity of existing public sewers within the study area. It is understood (telecon Mr V Mohun Gifford to Mr I Conner UU 21/05/07) that the existing surface water sewers within the study area run at full capacity during heavy rainfall events. Although running at capacity, it is further understood that there are no reported incidents of flooding from public surface water sewerage in the study area.

Other Sources

8.5.12 The Mersey Estuary CFMP suggested other flooding sources could include rapid snowmelt and mud floods. The CFMP considered it unlikely that either could occur within the study area.

9. DRAINAGE STRATEGY

9.1 introduction

9.1.1 This section sets out the principles behind the drainage for the Project. It covers the proposed method of collection of surface water run-off, retention, pollution control and the eventual disposal to outfall.

9.1.2 The objective of this drainage strategy is to develop an approach which effectively drains the Project, keeping any detriment to the existing water environment to a minimum. Specifically this report aims to:

a. Identify natural catchments that contribute flow to the highway drainage system;
b. Develop a hierarchy of drainage solutions to provide for the storage, treatment and discharge of highway generated run-off;
c. Identify existing 100 year return period flow rates at outfall points, providing attenuation to address an increase of 20% in rainfall intensity due to climate change;
d. Provide an assessment of the likely performance with respect to the treatment ability of selected solutions,
e. Identify the locations where each conceptual solution will apply,
f. Identify locations for proposed features for the attenuation of run-off,
g. Identify outfall points that are to be re-used, retained or abandoned,

9.1.3 Particular drainage strategies that could be adopted along the highway to meet the objective are identified, taking into consideration the constraints on available land, the likely cost of any options and buildability issues.

9.1.4 Existing watercourses will be accommodated within the scheme and will be culverted where the proposed highway crosses them. Ditches will generally be connected into the new drainage for the scheme, or culverted. Where culverts are required, care will be taken to avoid excessive lengths by orientating them perpendicular to the direction of the proposed highway.

9.2 Consideration of Drainage Systems

9.2.1 The Project, as with all other contemporary highway schemes, will be incorporating forms of Sustainable Drainage Systems (SUDS). This section will discuss the advantages and disadvantages of their use SUDS in this Project. The different systems are suitable use in combination and their selection is generally determined by local conditions such as geology and groundwater characteristics.

'Over-the-edge' Drainage/Filter Strips

9.2.2 This form of drainage allows filtration, and to a lesser degree sedimentation to occur as the water flows over the vegetated slope. It is best used in conjunction with swales at the base of embankments.

9.2.3 With over the edge drainage problems can occur with soil erosion, topsoil slippage, softening of the side slopes and embankment stability will need to be addressed at the detailed design stage.

9.2.4 The inherently simple construction allows for easy maintenance. Nevertheless ground to the north of the Mersey is polluted and could present if a health and safety risk if disturbed. If used incorrectly this type of drainage adds water to groundwater and might cause movement of pollutant though leachate. Any digging of ground could risk mobilising of containments which are likely to be hazardous. In areas of high contamination over the edge drainage filter strips are unlikely to be suitable.

9.2.5 Due to their simple construction and maintenance, over the edge drainage/filter strips could be used. However, their locations of use should be carefully selected to avoid mobilisation of pollutants.

Swales

9.2.6 Swales are linear shallow sided grassed ditches that provide conveyance and storage of highway runoff. They can be inexpensive to construct as they are very similar to normal landscaping areas, but require land. Figure 9.1details typical drawings of swales.

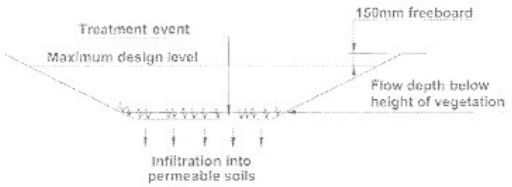
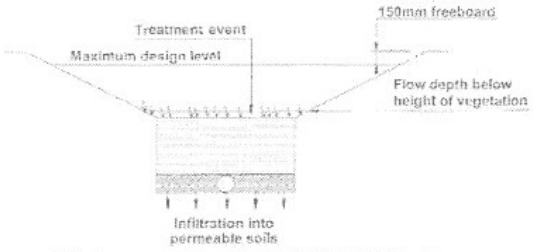
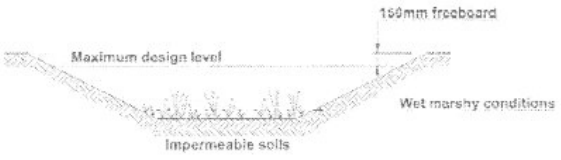
Swale type	Description	Elevation
1. Standard conveyance swale	Conveyance swales are broad, shallow vegetated channels. These are particularly effective ways of directing and conveying runoff from the drained area to another stage of the surface water management train. They can be designed for vegetative filtration or detention, depending on the level of flow constraint and ponding depths appropriate at the site. Very small swales (mini-swales) can be used to manage small events with effective overflow facilities to alternative SUDS/piped systems. In some locations, such as pollution hotspots, conveyance swales may require lining to prevent infiltration.	
2. Dry swale	The dry swale is a vegetated conveyance channel, designed to include a filter bed of prepared soil that overlays an under-drain system. This provides additional treatment and conveyance capacity beneath the base of the swale. As they remain dry most of the time, they do not become boggy during wet weather. In some locations, such as pollution hotspots, dry swales may require lining to prevent infiltration.	
3. Wet swale	This system is equivalent to the conveyance swale (1), but designed to encourage wet and marshy conditions in the base to enhance treatment processes. This can be achieved using liners or, where underlying soils are poorly drained (or water tables are high), in combination with shallow gradients.	

Figure 9.1: Typical Swale design (Source CIRIA C697)

9.2.7 These features will be directed towards storage features such as detention basins and possibly retention ponds before discharge to existing watercourses and ditches at controlled pre-developments rates. Swales will be sized to accommodate highway and a proportion of embankment/verge run-off drainage.

9.2.8 They differ from normal roadside channels in that the flow of water is designed to be slower, so filtration, and to a lesser degree, sedimentation may occur as the water flows over and through the grass. They are most effective on shallow gradients where water flow is slowest. On relatively steep sections of land, it is also proposed that the swales are locally deepened at regular intervals effectively providing on-line detention basins and simple check dams typically at 15m centres are also provided.

9.2.9 While swales are not considered to be the most effective form of sustainable drainage in terms of pollutant removal compared to other sustainable drainage features, they will provide some mitigation of diffuse pollution. The incorporation of local deepening/check dams will improve this considerably. Swales are also advantageous in collection of sprays from traffic travelling on wet surfaces which has been identified as a source of significant contamination adjacent to highways, and can assist in the identification and control of accidental spillages.

9.2.10 Swales in the northern part of the scheme will have to be designed carefully. The land north of the Mersey is polluted and if water is able to pass through the swale, the water may cause the pollutants to mobilise. If in construction of swales the ground is dug out this a health and safety risk to contractors and the public. Therefore swales in the northern part of the scheme must not disturb the ground and allow highway water to infiltrate through the ground. Swales in this area will require to be built above the ground with the base level and construction designed to prevent water from infiltrating through the ground. Therefore the swale will have no effect on the groundwater regime.

Swales are a suitable system for this scheme but again, their location needs to be carefully considered to avoid mobilising a pollution risk.

Filter Drains (acting as infiltration trench if ground conditions are suitable)

9.2.11 Filter Drains are linear perforated pipes in gravel filled trenches providing limited filtration and then conveyance of run-off. Filter drains can also be used to remove groundwater where the proposed highway is in cutting and are therefore, proposed on this scheme for all areas where the road is in cutting. A typical filter drain is given in Figure 9.2.

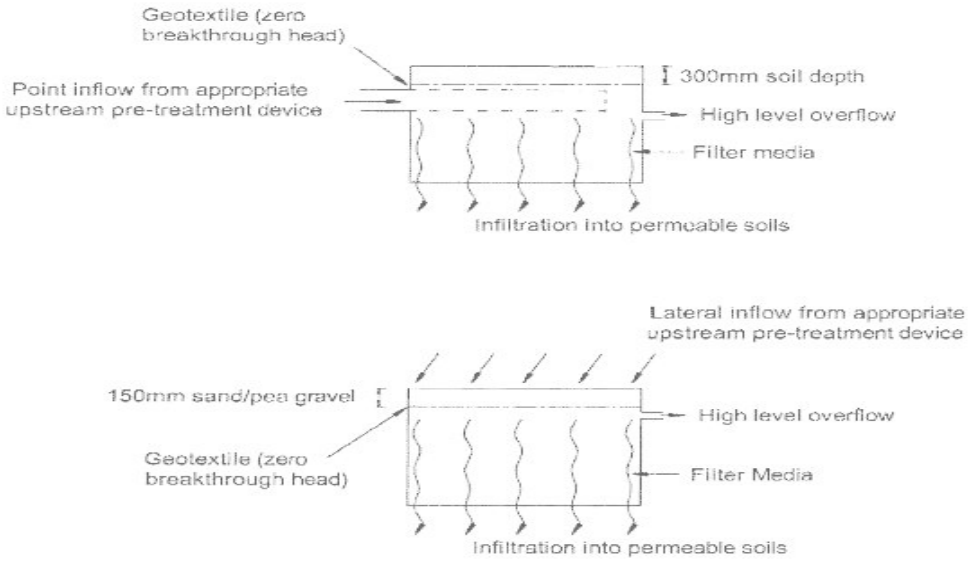


Figure 9.1 *Infiltration trench schematics*

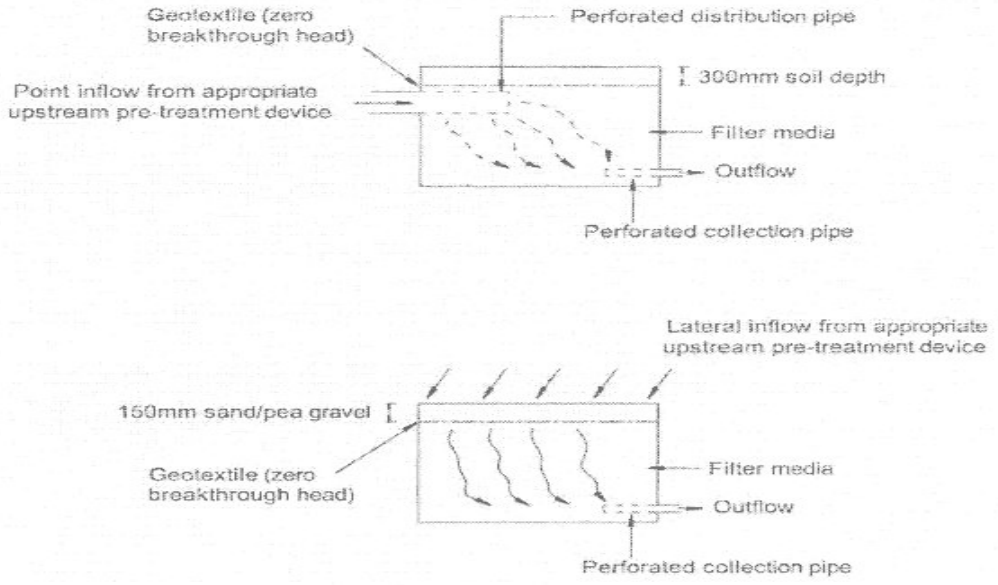


Figure 9.2: Filter Drain (Source: CIRIA C697)

9.2.12 This form of drainage can be prone to 'stone scatter' which presents a potential safety hazard to other road users. Detailed design of these features will need to consider appropriate methods to mitigate this such as the use of topsoil over the drain (with geotextile separator) and covering with covering bitumen bound shredded tyres.

9.2.13 Again this type of SUDS will be unlikely to be used in highly polluted areas as the water infiltrating into the ground may cause movement in the pollutants in the ground and presenting a health and safety risk to the site.

9.2.14 Filter drains are suitable for use in this scheme but, again their location needs to be carefully considered to avoid mobilising pollutants.

Detention Basins

9.2.15 Detention basins or dry ponds remain dry during periods of low rainfall and are located to receive runoff from conveyance systems prior to discharge the watercourses/ditches at controlled flow rates. Basins will be sized to allow storage of excess flows until they can drain, and are located to receive runoff from conveyance systems prior to discharge to watercourses/ditches at controlled flow rates. Discharge will generally be controlled via vortex flow control device or reduced sized orifice plate as appropriate. Figure 9.3 are drawings of typical detention basins. This type of drainage will be acceptable for the road scheme.

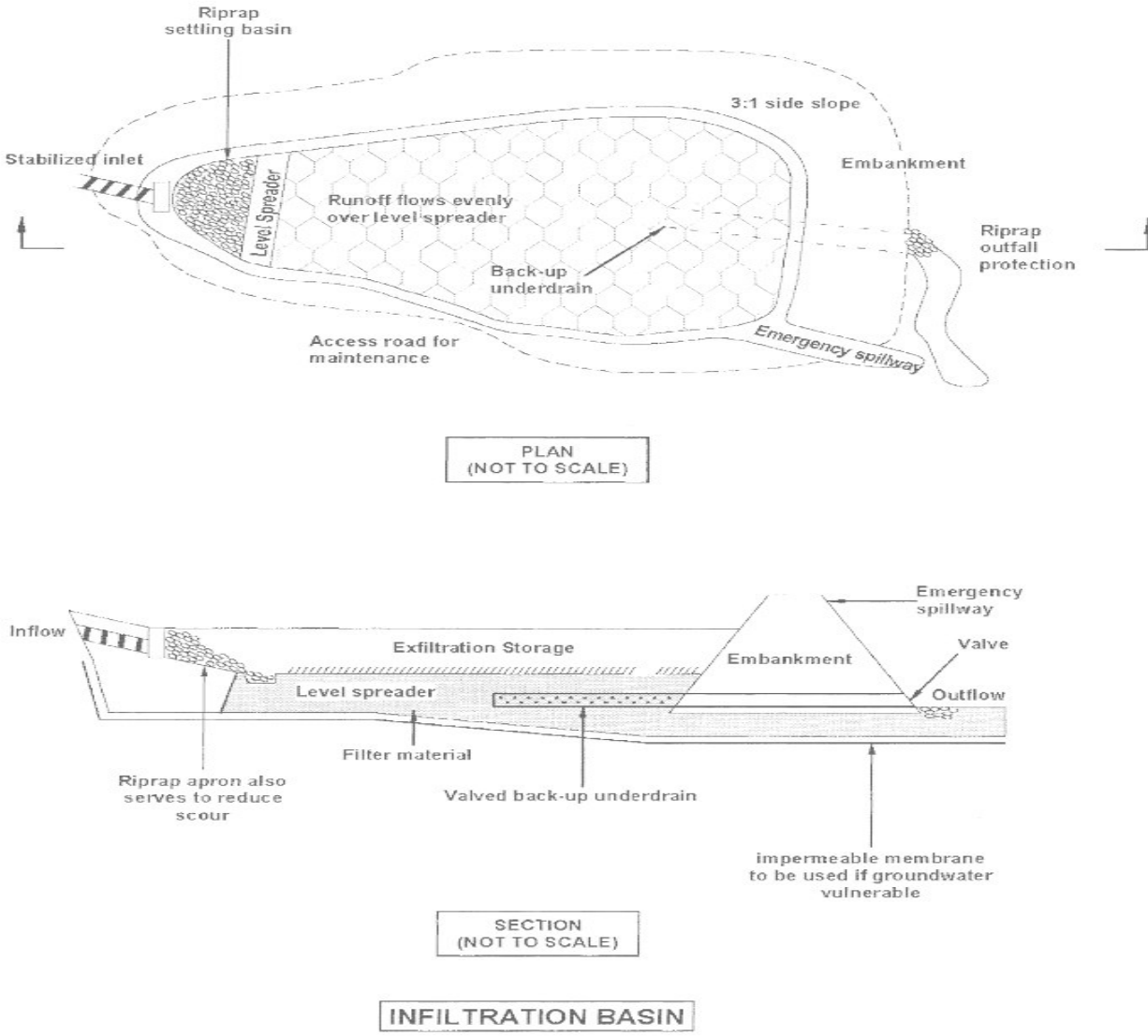


Figure 9.3: detention Basin (Source: DMRB)

9.2.16 If topography is not suitable for landscaped ponds, the use of underground plastic geo-cellular units will also be considered.

9.2.17 Some removal of pollutants would occur in the detention basins by filtration through vegetated soils.

9.2.18 'First Flush' basins are separate attenuation basins that will be provided at areas of higher risk of diffuse (non-point) fuel/oil spillage (e.g. roundabouts). Studies have shown that frequently occurring storms produce the majority of surface runoff and hence the majority of pollution. This process is often referred to as 'first flush' and basins will be sized to approximately accommodate the 1 in 1 year rainfall event (100% chance of annual occurrence) and will incorporate siphons (enabling them to act in a similar manner to petrol interceptors) to contain suspended solids and fuel/oil, and also allow emergency containment of potential spillages.

9.2.19 Extended detention basins will also be considered for high risk areas where runoff is stored beyond the time for infiltration (where this is appropriate), to provide extra time for natural processes to remove some of the pollutants for the water.

9.2.20 Detention basins are suitable for use in their scheme, but their construction needs to be carefully designed and carried out to avoid mobilising pollution.

Balancing Ponds

9.2.21 Balancing ponds (or wet ponds) are similar to detention basins, but include a permanently wet area during periods of low rainfall. The volume of water stored is in addition to any volume to be retained as part of any flood defence purpose, and provides amenity value and treatment to highway run-off. Quality of highway run-off is improved prior to discharge to watercourses from settlement of suspended solids and biological action on fuel/oil discharges. Figure 9.4 shows typical drawings of balancing ponds.

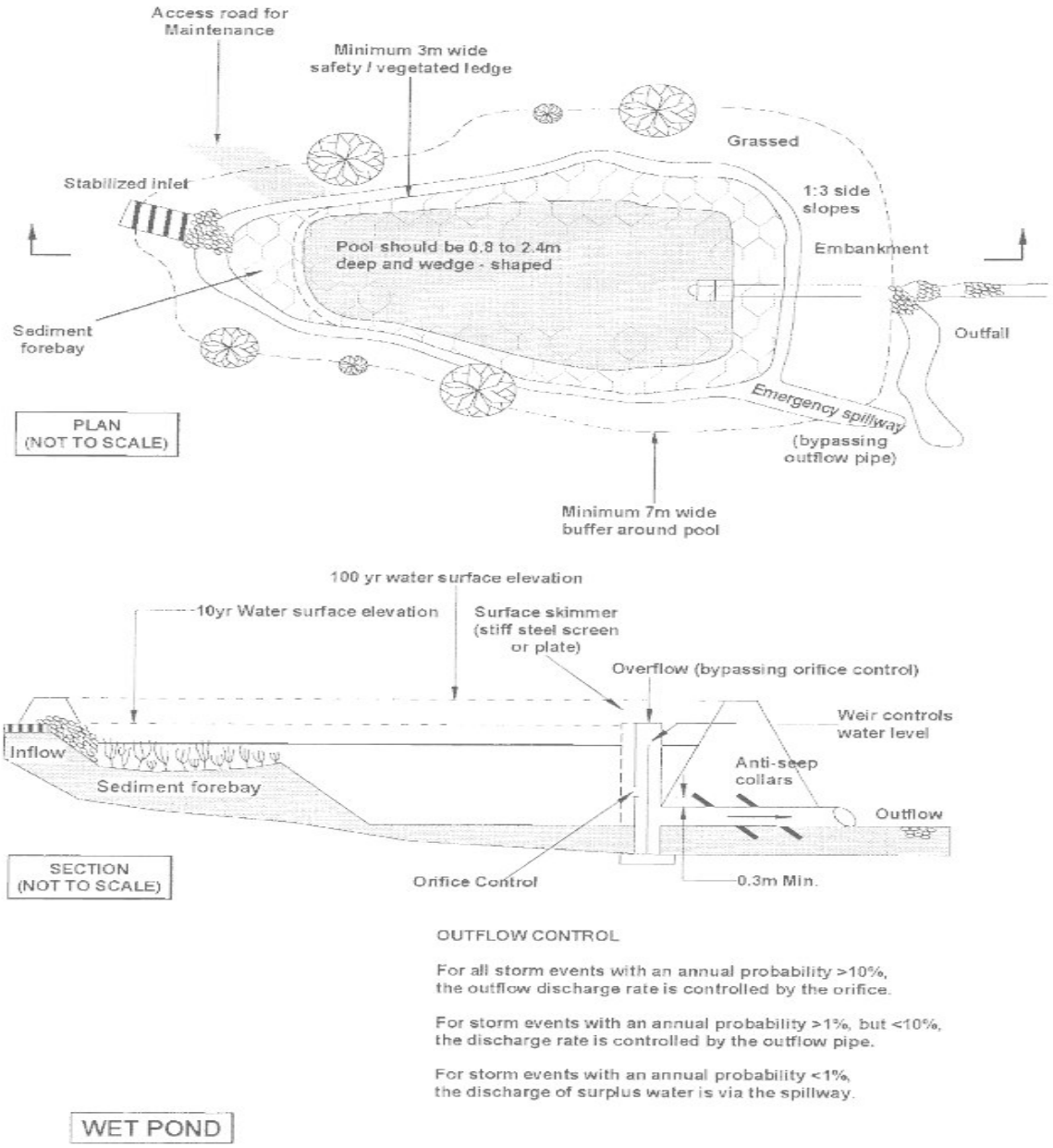


Figure 9.4: Balancing Pond (Source: DMRB)

9.2.22 Balancing ponds will be designed with a clay base or an impermeable area. If a balancing pond has an impermeable base, water will not enter the ground and therefore will not cause changes in the groundwater regime. Balancing ponds will be built above ground to minimise the risk of disturbing the ground and causing hazardous substances to be unearthed.

9.2.23 Balancing ponds are suitable for use in this scheme but, again, their construction needs to be carefully designed and carried out to avoid mobilising pollutants.

Constructed Wetlands

9.2.24 Wetlands are essentially detention basins that, which are permanently saturated by surface water or groundwater so that they can support aquatic or semi-aquatic vegetation such as reed swamps, marches or bogs, depending on the degree of saturation or inundation. Figure 9.5 provides typical drawings for constructed wetlands.

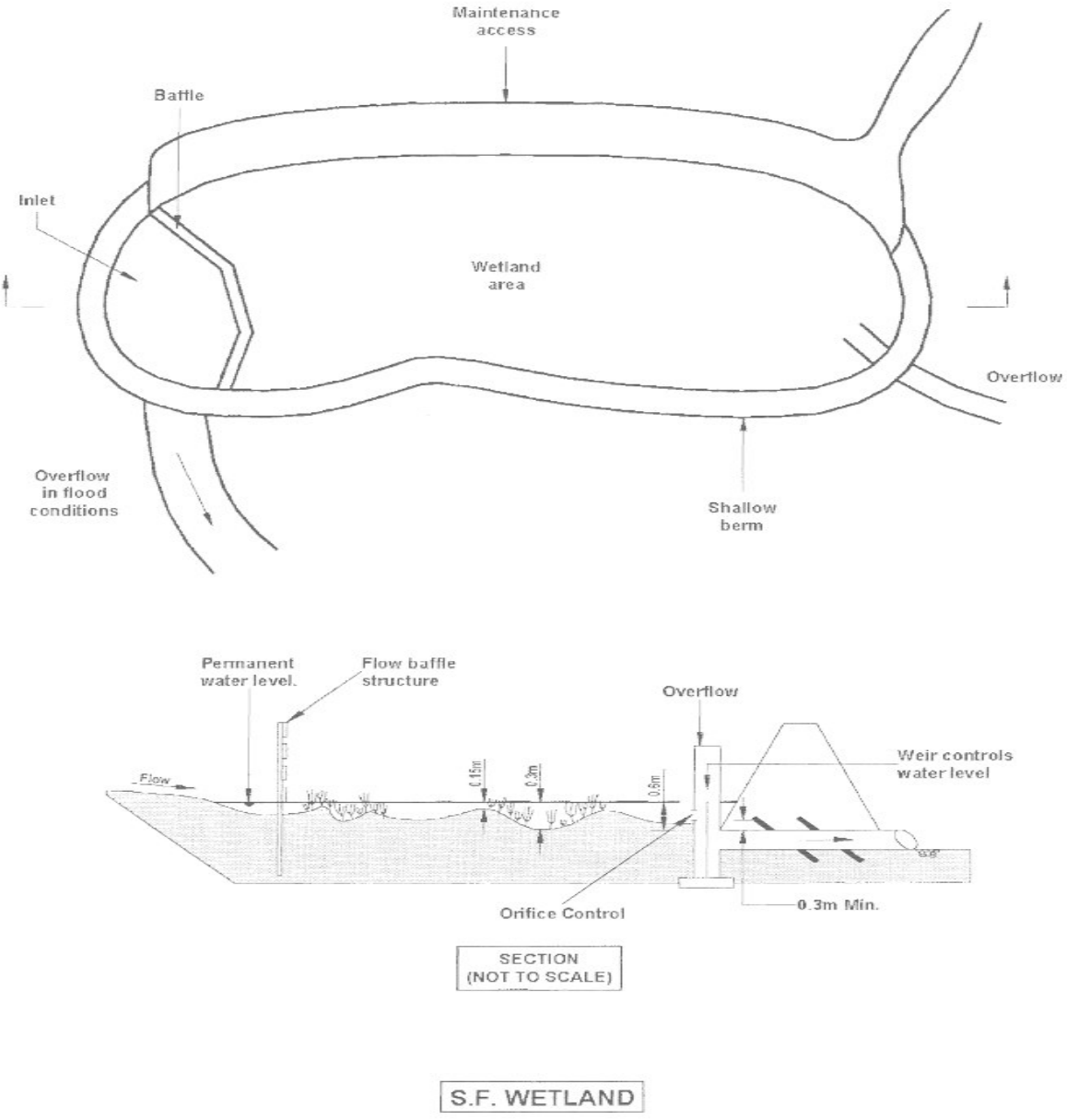


Figure 9.5: Constructed Wetland (Source: DMRB)

Conventional Piped Drainage

9.2.25 Conventional piped drainage would be at areas of the proposed scheme where 'over-the-edge' drainage is unsuitable. This would typically be at areas where kerbs are required due to road user safety reasons such as roundabouts (DMRB, HA 83/99) and for diversions of existing kerbed highways. Highway run-off would be collected via conventional trapped gullies or combined kerb drainage systems, before discharging appropriately into SUDS units. Figure 9.6 shows typical drawings of conventional piped drainage.

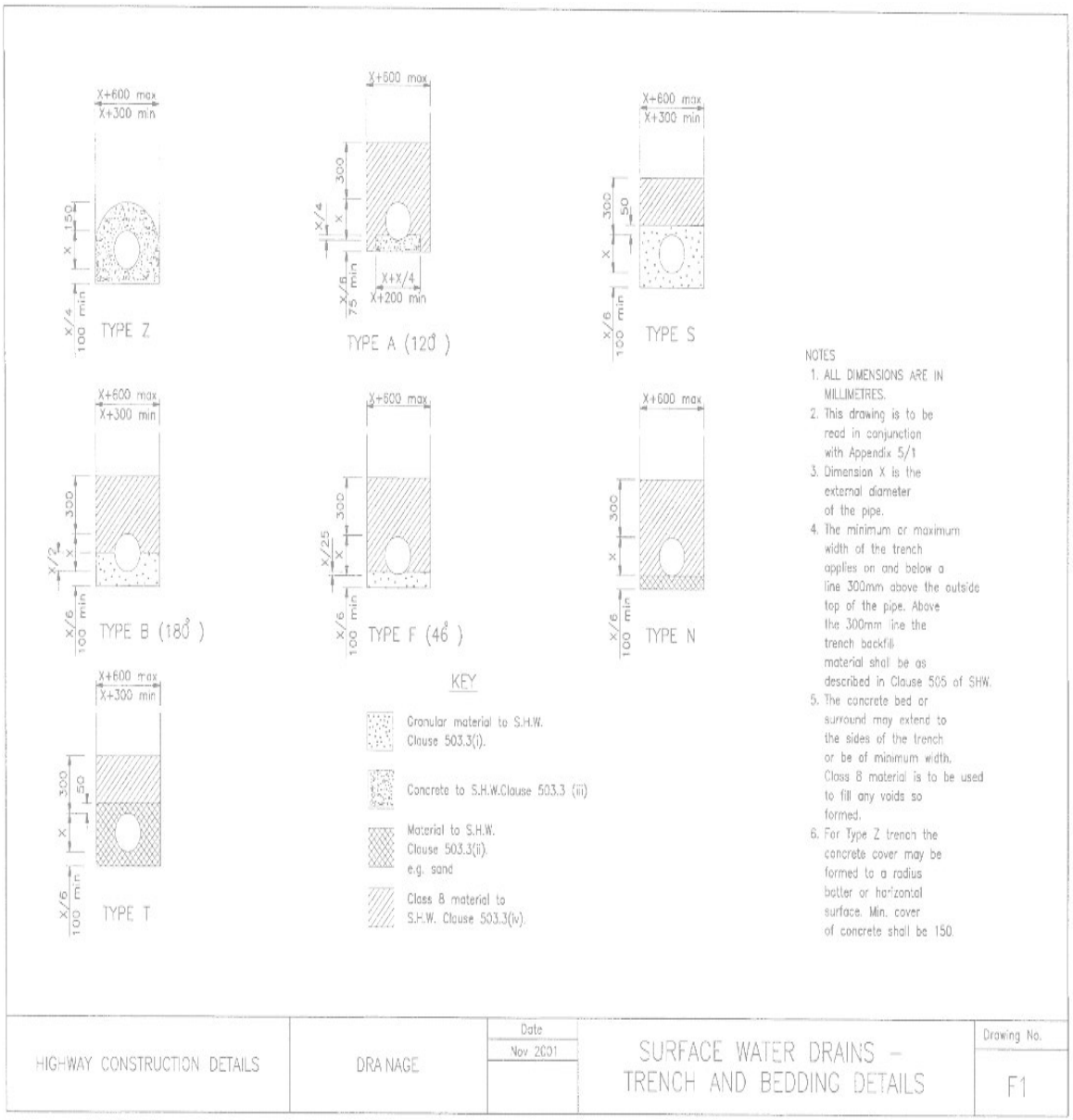


Figure 9.6: Conventional Piped Drainage (Source: DMRB)

9.2.26 This type of drainage is suitable for use in this scheme where land take is a priority or where existing systems can be adapted. There will be no additional disturbance of ground as the pipes will be embedded within the main construction.

Geocellular Systems

9.2.27 Geocellular systems are used to control and manage runoff either as a soakaway or as a storage tank and can be tailored to suit the requirements of most sites. In addition, they can be used for storing roof/rainwater before recycling. Figure 9.7 shows a typical geocellular systems.

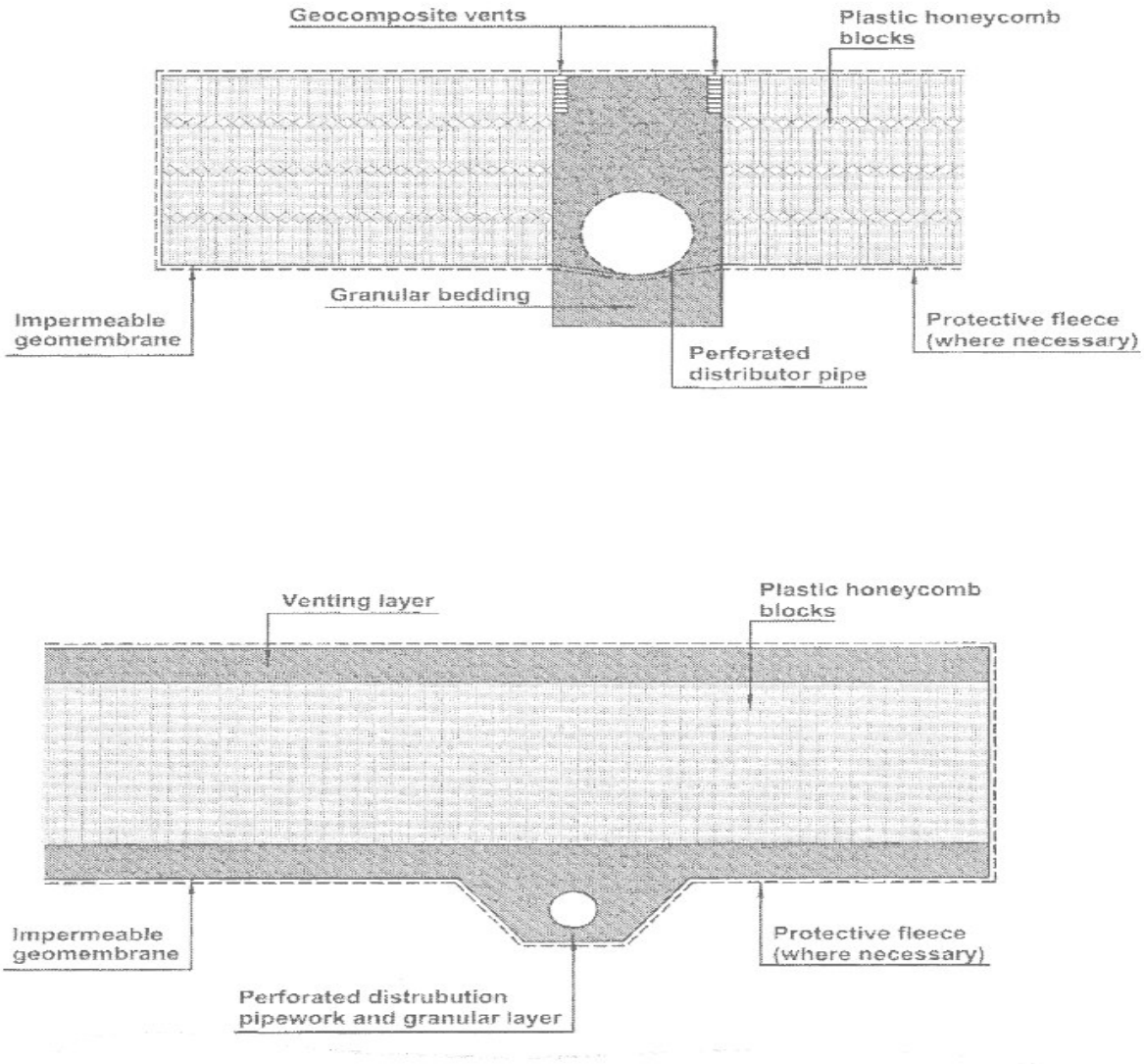


Figure 9.7: Geocellular System (Source: CIRIA C697)

9.2.28 Geocellular systems used for storage can be tailored to be used in contaminated land conditions to prevent infiltration. Clearly, in these conditions, their use as a soakaway would not be sensible.

9.2.29 Geocellular system can be designed into the embankment construction to reduce land take, where embankments are required.

9.2.30 Geocellular systems are likely to be useful in this scheme, when land take is an issue. Their design and construction must take into account any pollution risks.

Headwalls

9.2.31 An outfall headwall is essentially a brick or concrete structure through which a pipe passes though. The structure acts as a means contain the pipe, transitioning between buried trench and open channel. It is important to note that each headwall must be designed using relevant practice guidelines and to the requirements of the consenting body, the EA.

Summary

9.2.32 The current proposals seek to make best use of SUDS, which are being promoted by PPS25 and DMRB. These will be used in combination with conventional drainage conveyance systems. These features will be directed towards storage features such as balancing lagoons before discharging into watercourses and ditches at controlled (pre-development) rates. Swales are likely to be used in areas where groundwater conditions are acceptable.

9.2.33 The detailed proposals will be presented for approval by the local authority and the EA, including formal flood defence consent for any works within 8 metres of a main river and works affecting the flow of the river for ordinary watercourses.

9.3 Drainage Strategy

9.3.1 The alignment of the Project follows closely that of existing highway routes. It is only that elevated section of highway above the Mersey Estuary, and those sections through industrial Brownfield sites, that would create additional lengths of highway.

9.3.2 The drainage of the Project is hydraulically similar to that of the existing highway. There are sections of the proposed highway that would introduce new surface areas that will need to be drained to a suitable point. Junction reconstruction work and highway de-linking at sections of the Project would produce a reduction in highway surface area in some sections, but an increase in area at other sections.

9.3.3 The proposed new sections of highway are: the toll plazas; the Ditton Road junction; the Widnes Loops junction; the main bridge deck over the River; the Bridge approach spans; Lodge Lane junction and the M56 Junction 12 interchange. Where there is a gross increase in highway surface area the drainage from it should be restricted to a rate equivalent to that from a Greenfield site. This can be achieved by providing a holding area (e.g. a balancing pond) for collected surface water, allowing water to be released at a restricted maximum rate of flow.

9.3.4 It is proposed to de-link sections of the existing highway, particularly those sections that favour use of the existing SJB. The de-linking would generally entail the stopping up of the highway and the removal of drainage. This would result in the generation of proportionately less surface water runoff.

9.3.5 At sections where the existing highway is modified the existing drainage regime will be preserved as there is no significant variation in surface area to be drained as a result of this work.

9.3.6 The proposed Drainage Strategy for the Project will make significant alterations to the existing catchments, both in terms of the impermeable areas and the drainage outfalls. The scheme provides an opportunity to improve the existing water quality, through protection and enhancement, both reducing the amount of surface water discharged to ground and by improving the pollution control strategy. The drainage strategy will decrease the amount of water entering the watercourse as areas historically with unlimited discharge are to be restricted to Greenfield rates. The use of SUDS will improve water quantity, decrease risk of flooding through storage of water and should aid local to biodiversity.

Discharge to Watercourses

9.3.7 The EA has stated that discharges from the works into the main river watercourses are to be restricted to pre-development 'Greenfield' runoff rates. The footprint of the proposed scheme covers an area of approximately 69 hectares. Sub-catchments have been identified along the route with separate discharges to existing watercourses.

9.3.8 The majority of the discharge will be to watercourses, via existing discharges and one discharge will be to St Helens Canal. The discharge to existing watercourses and surface water systems, where there is an increase in impermeable areas will be restricted to Greenfield rates. Discharging into the canal will be restricted to a velocity of 0.3m/s as confirmed by the Council.

9.3.9 The Greenfield runoff rate has been calculated using the DEFRA/EA guidance note 'Flood and Coastal Defence R&D Programme'. The calculated values are:

Q_{BAR} = 6.3 l/s/ha (litres per second per hectare)
Q_{1yr} = 5.3 l/s/ha
Q_{30yr} = 11.3 l/s/ha
Q_{100yr} = 13.1 l/s/ha

9.3.10 Q_{BAR} is the average annual maximum rate of flow for a given catchment. The other Q designations refer to the likely maximum flow rate that could be experienced in one year (Q_{1yr}) 30 years (Q_{30yr}) and 100 years (Q_{100yr}).

9.4 Proposed Drainage

9.4.1 The area of carriageway for the existing highway and the Project have been assessed, the results of which are presented in Table 9.1. Appendix G presents the tabular information geographically. There is a net increase in the surface area of the Project, and thus there will be an increase in surface water runoff. It is proposed to attenuate the net increase in runoff by implementing SUDS at strategic locations. The proposed drainage for the Project is discussed further in this section.

Construction Area	Location	Proposed Area (ha)	Existing Area (ha)	Difference (ha)
A and B	St Michael to Ditton Road	14.3	7.4	6.9
B, C and D	Ditton Road to MSC	17.0	2.2	14.8

E and F	MSC to Bridge Junction	7.7	4.7	3.0
G	Lodge Lane Junction	6.2	4.5	1.7
H	Weston Link to M56 Motorway Junction	6.9	6.6	0.3
I	SJB De-linking	4.2	5.4	-1.2

Table 9.1: Comparison of existing and proposed carriageway surface areas

9.4.2 The drainage diagrams are illustrated on Drawing Nos. B4027/4/FRA/2a to 2i inclusive. Drawing No B4027/4/FRA/2a provides an overview of the entire Project; the remaining drawings provide detail of the project over sequence of eight drawings. The proposed drainage associated with the project is summarised below: reference to individual figures is made for convenience.

Section A and part of B: St Michael's Road to Ditton Road - Drawing No B4027/4/FRA/2b

9.4.3 The proposed impermeable area will be 14.3 ha whilst the existing is 7.4 ha. Therefore this is a net increase of 6.9 ha. The existing A562 Speke Road crosses the St Michael's Golf Course on an elevated embankment at levels between 12m and 18m AOD. It is drained via a series of roadside gullies to highway carrier drains, which discharge unrestricted directly to Stewards Brook watercourse.

9.4.4 The proposed highway would be constructed on the same alignment as the existing A562. It would be widened to accommodate the main toll plazas, and to accommodate slip roads for both east and westbound traffic to join local roads at the proposed Ditton Junction.

9.4.5 Drainage from the widened carriageway would be collected and discharged to balancing ponds located on the former St Michael's Golf Course. These balancing ponds will be built to minimise the risk of disturbing the ground by raising the ponds above ground and building up the banks. The issue of health and safety will be dealt with by the concessionaire at the detailed design stage of planning. The outlet from the balancing ponds would be restricted to the equivalent Greenfield runoff value and outfall to Stewards Brook.

9.4.6 The drainage proposal at this area will provide betterment as the volumetric discharge rate under the proposed development will be less than the existing discharge from this part of the carriageway. The reason is the discharge from the existing carriageway is unrestricted and water flows directly into the brook. The new discharge will be restricted to a 1 in 2 year Greenfield discharge (Q med) with attenuation for 1 in 100 year rainfall event plus a further 20% volume for climate change.

Section B, C, D: Ditton Road to Manchester Ship Canal - Figures B4027/4/FRA/2c and 2d

9.4.7 This section is a new highway and would be constructed on a raised embankment on land currently occupied by industrial units. There are sections of existing highway that would be de-linked, which would represent a reduction in surface water runoff. The proposed new impermeable area will be 17.0ha and the existing impermeable area is 2.2ha. This would be a net increase of 14.8ha.

9.4.8 A new highway junction (the 'Widnes Loops' Junction) will be formed with the A557, with the carriageway continuing over Widnes Warth and the River Mersey, reaching its highest point above the Manchester Ship Canal.

9.4.9 Surface water runoff from the bridge deck and its northern approach span, together with runoff from the new Widnes Loops junction and the Widnes Loops toll plazas, represents a net increase in highway area. Runoff from the carriageway and from the Widnes Loop toll plazas would be collected and discharged into a large swale and an offline detention basin, which would be sized to restricted to 500 l/s. The water would be discharged to the St. Helen's canal.

9.4.10 Halton Borough Council has not stipulated a restriction in flow rate to the canal from the proposed swale other than a discharge velocity not exceeding 0.3 metres per second. This type of attenuation will be above the ground to minimise the risk of leachate and will be built to ensure no infiltration into the existing ground.

Section E and F: Manchester Ship Canal to Bridgewater Junction - Figure B4027/4/FRA/2d

9.4.11 The proposed highway is elevated on piers as it crosses the Manchester Ship Canal, and transitions to a raised embankment above the Astmoor Industrial Estate to its junction with the A533/A558 Central/Daresbury Expressway. The existing drainage is unrestricted.

9.4.12 The proposed new impermeable area will be 7.7 ha, and the existing impermeable area is 4.7ha therefore there is a net increase of 3.0 ha in carriageway surface area. Surface water runoff from it would be captured and contained within a balancing pond before being release to existing highway drainage at a flow rate no greater than the equivalent Greenfield runoff rate.

9.4.13 This will be an advantage as the ponds will give an environmental benefit to an urban area. This drainage regime will be an improvement to the existing drainage as the water will be restricted to Greenfield rates and attenuation will be up to 100 year rainfall event plus a further 20% volume for climate change.

Section G: Lodge Lane Junction - Figures B4027/4/FRA/2d -2f inclusive

9.4.14 The existing drainage regime of the A533/A558 carriageways would not be affected by the construction of the new carriageway and has its own drainage system. Therefore the drainage will be left in place.

9.4.15 Lodge Lane Junction has a proposed impermeable area of 6.2ha and the existing impermeable is 4.5ha. Therefore there is a net increase of 1.7ha. A balancing pond will be required for the excess surface water from the new proposed junction. The discharge from this pond will be restricted to Greenfield run off and discharged into Flood Brook. The balancing pond will be sized to hold the 1% rainfall event plus a further 20% volume for climate change.

9.4.16 This surface water solution will be an improvement to the existing drainage. Due to the restriction on discharge there will be a decrease in volumetric discharge rate of water entering Flood Brook. This decrease will reduce the risk of surface water flooding in Flood Brook. The pond could increase biodiversity to the Lodge Lane Junction.

Section H: Weston Link Junction and M56 Motorway Junction 12 - Figure B4027/4/FRA/2g

9.4.17 The Weston Link Junction and M56 Motorway Junction have a proposed area of 6.9ha. The existing area is 6.5ha. Therefore there is a net increase of 0.3ha.

9.4.18 There is a slight increase in impermeable area in this part of the proposed scheme. Above ground SUDS would not be acceptable because of protected orchids growing in the areas where such a system could be placed. Therefore for this part of the scheme over sized pipes will be used. The discharge will be restricted to Greenfield runoff rate. Attenuation will be up to and including the 1% rainfall event plus 20% volume to take into account climate change.

Section I: Silver Jubilee Bridge De-linking Runcorn - Figures B4027/4/FRA/2h and 2i

9.4.19 Slip roads that link the A533 Silver Jubilee Bridge direct to and from the A557 dual carriageway are to be removed. The proposed impermeable area is 4.2ha and the existing impermeable area is 5.4ha. Therefore there is a net decrease in impermeable area of 1.1ha. Consequently there will be a reduction in the volume of surface water runoff generated by the remaining carriageway surfaces. The existing highway drainage arrangement should prove satisfactory.

9.5 Attenuation Features

9.5.1 Balancing pond attenuation of surface water runoff is proposed at four locations – see Table 9.2. The preliminary calculations provided a storage volume for the 1 in 100 year rainfall event (using the Preliminary runoff method). These calculations could change if the Project size or layout changes and so should be re-checked if this happens. In accordance with current national guidelines an additional 20% has been added to each calculated volume to allow for climate change. The detailed design of the ponds by the Concessionaire should account for health and safety risks.

Location	Area Drained (Ha)	Outfall	Storage Volume (m^3)	20% Enhanced Volume (m^3)
Main Toll Plaza (Golf Course) (Two ponds)	14.3	Stewards Brook	5,600	6,800
Bridgewater Junction	7.7	Existing Highway Drainage	3,000	3,600
Lodge Lane Junction	6.1	Existing Highway Drainage then Flood Brook	2,400	2,900

Table 9.2: Balancing Ponds

9.6 Swales and Detention Basin

9.6.1 The unrestricted discharge to St Helens canal will be a maximum discharge of 500l/s. From initial designs the peak storage required would be approximately 3,600 m^3. The swale would have dimensions of 10 metres wide and sloping sides 2m high on one side and 2.5m on the other with side slopes of 1 in 4. If the swale is overtopped water would spill into a detention basin. The swale would be 120m long and at a slope of 1%. This slope would ensure that the velocity is kept low and assist with uptake of pollution. In high rainfall events the water can overtop the bank and enter a detention basin which would be between the road embankment and the swale. The detention basin area would be approximately 2,600m^2 and would be a depth of 1m to make storage approximately a 2,600m^3

9.6.2 The swale would be a benefit in removing pollution water from the proposed scheme. The swale physical traps sediment by slowing down the water and cause sediment to drop by gravity.

9.7 Construction and Maintenance

9.7.1 Construction period drainage issues are not considered as part of this report, but the contractor will comply with all relevant legislation, and liaise with the EA to gain all necessary approvals as required

9.7.2 As with any conventional drainage, sustainable drainage must be constructed such that it operates as intended and requires an effective maintenance regime. Information will be provided to the contractor such that site staff can be educated how the drainage scheme is intended to operate, and how actions on site might affect the final performance of the scheme. An ongoing maintenance scheme will also need to be agreed with the relevant stakeholders when the detailed design is prepared, and for the purpose of this report, a brief indication of the likely maintenance regimes required has been compiled as follows.

9.7.3 CIRIA Report C609; 'Sustainable drainage systems; Hydraulic, structural and water quality advice' has been referred to in the following text as guidance on current best practice, and this will form the basis of the detailed maintenance strategy for agreement with the relevant stakeholders. This strategy will ultimately be complied as an 'owners manual' covering planned, routine and emergency maintenance of the drainage features used in the scheme.

9.7.4 CIRIA Report C625; 'Model agreements for sustainable water management systems; Model agreements for SUDS' or other appropriate method will be used to allocate the responsibilities for the maintenance of the systems through legal agreement between the relevant stakeholders.

'Over-the-edge' Drainage/Filter Strips

9.7.5 Filter Strips are a relatively low maintenance SUDS technique, but continued operation does require some regular maintenance. CIRIA Report C609 provides a recommended maintenance schedule for filter strips and this will be used as the basis for developing a maintenance strategy. This strategy can be incorporated as part of the landscape maintenance regime.

Swales

9.7.6 If correctly designed, swales can last indefinitely, but continued operation does require some regular maintenance. CIRIA Report C609 provides a recommended maintenance schedule for swales and this will be used as the basis for developing a maintenance strategy. This strategy can be incorporated as part of the landscape maintenance regime.

9.7.7 An advantage of this method of drainage (compared to traditional piped drainage) is that ongoing monitoring of the swale performance can be carried out visually and swales are readily accessible for planned/ emergency maintenance.

Filter Drains

9.7.8 CIRIA Report C609 provides a recommended maintenance schedule for filter drains, including monthly inspections, annual surface sediment removal and long-term (typically every 10 years) replacement as necessary.

Detention Basins

9.7.9 CIRIA Report C609 provides a recommended maintenance schedule for retention ponds covering frequencies from monthly to 25 years or greater. This strategy can be incorporated as part of the landscape maintenance regime, (therefore having marginal cost implications).

9.7.10 If correctly designed and maintained detention basins can last indefinitely, and detailed design will include access route for vehicles and details of the maintenance strategy requirements.

Retention Ponds

9.7.11 CIRA Report C609 provides a recommended maintenance schedule for retention ponds covering frequencies from monthly to 25 years or greater but state that an effective maintenance regime is crucial to their water quality performance. This strategy can be incorporated as part of the landscape maintenance regimes.

9.7.12 If correctly designed and maintained, retention ponds can last indefinitely, and detailed design will include access routes for vehicles and details of the maintenance strategy requirements.

Constructed Wetlands

9.7.13 CIRIA Report C609 provides a recommended maintenance schedule for constructed wetlands covering frequencies from monthly to 25 years or greater but states that an effective maintenance regime is crucial to their water quality performance.

9.7.14 If correctly designed and maintained constructed wetlands can last indefinitely.

Geocellular System

9.7.15 Maintenance of geocellular systems could be incorporated into the existing highway maintenance regime for the local highways, using existing equipment/ personnel.

Conventional Drainage

9.7.16 Maintenance of conventional drainage techniques in the form of trapped gullies and pipes/manholes could be incorporated into the existing highway maintenance regime for the local highways, using existing equipment/ personnel.

9.8 Pollution Control

9.8.1 The drainage proposals for the new scheme seek to improve the quality of water entering watercourses. On the basis that drainage of the existing road network does not have any particular measures for addressing water quality, construction of the Project with measures for water treatment will be an improvement on the current situation. Contamination from existing highways (and mitigated potential pollution from the Project) includes that from 'normal' road use (such as tyre wear and oil drips), spillage during accidents, maintenance work (such as use of herbicides), and gritting/de-icing in cold weather.

9.8.2 Water quality sampling has been undertaken for existing watercourses in the vicinity of the scheme (see Chapter 8 of the ES, Surface Water Quality, for details). Detailed results of this sampling are not reported here, but the proposed drainage system will include locations for further sampling of run-off quality to enable future comparison with baseline conditions.

9.8.3 Primary treatment of the highway runoff will be provided by either traditional deep pot trapped gullies or catchpit chambers. The design of the gully pots provides a suitable means of removing detritus, silt and some chemicals from the system.

9.8.4 Runoff from Widnes Loop junction and the Bridge is eventually discharged into a swale. The swale will provide further improvement of the runoff by breaking down hydrocarbons, detergents and other chemicals by natural organic processes.

9.8.5 The balancing ponds and swales across the scheme will have valves or penstocks placed just before the water from the highway enters these features. The valves and penstocks will be in place for stopping spillages entering the watercourses and stopping pollution incidents in the received watercourse. The pollution can then be contained, treated or pumped out before damage is done to the SUDS systems.

Pollution Control Measures

9.8.6 Individual spillage risk assessments have been undertaken at discharge locations to verify that proposed pollution control measures are adequate to mitigate the risk of a pollution incident at each discharge location. Whole life cost and operating efficiency must be of high consideration.

9.8.7 Acceptable methods of containment and pollution control include, but are not limited to;

a. Oil traps - An oil trap is a structure that will flush out oil in surface water run off.
b. Interceptors - A container for debris from run off.
c. Baffle boards - slow down flows and therefore attenuate the discharge.
d. Check dams - Check dams are used for holding water up to enable the water to have time to drop pollutants
e. Scum boards - Scum Boards are barriers which prevent the passage of floating particles
f. Vegetated swales - are a ditch which slows the water allowing sedimentation.
g. Grassed verges with filter material allows infiltration to remove larger particles from surface water
h. Isolated penstocks - comprise a flat plate, fitted to a pair of guide slots on a headwall or chamber wall, which is raised and lowered using a screw thread operated by a wheel.

9.9 Foul Water Drainage

9.9.1 The toll plazas associated with the Project will generate foul water from welfare facilities provided for operational staff.

9.9.2 There is proposed to be a total of four toll plaza sites. Each site will require a connection to public foul water sewer. The sites are summarised below:

a. Main Toll Plazas - Located on the former St Michael's Golf Course. Foul water connection could be made to the existing public foul water sewer that is indicated to cross the plaza site.
b. Ditton Road Toll Plazas – Connection could be made to the existing public foul water sewer that runs parallel to the A533 dual carriageway.
c. Widnes Loops Toll Plazas – Connection could be made to the existing public foul water sewer that crosses through the existing landuse (industrial estate).
d. Silver Jubilee Bridge Toll Plaza – Connection could be made to the existing public foul water sewer between the railway and the A533 dual carriageway.

9.9.3 The volume of foul water generated by the toll plaza welfare facilities is low and hydraulically not significant. Initial estimates suggest a combined flow rate from all facilities of less than 0.1 litres per second. Existing foul water sewerage would be able to convey flows in excess of 50 litres per second.

9.9.4 As the welfare facilities are generally raised above existing ground levels, it should be possible to drain the foul water by gravity to public sewerage. Should this not be possible then a pump will be necessary.

9.10 Conclusion

9.10.1 The current proposals seek to make best use of sustainable drainage systems, which are currently being promoted by government agencies as national policy. Appropriate sustainable drainage features have been identified such as balancing ponds, detention basins and swales to control surface water run-off from the proposed highway. These features will be directed towards storage features before discharge to watercourses and ditches at controlled (pre-development) rates.

9.10.2 The drainage strategy seeks to decrease surface water runoff rate and pollution of highway run-off before it enters watercourses in the area.

9.10.3 The drainage of the existing road network has no particular measures for addressing water quality and the streams in the area are already considered to be adversely affected by highway run-off. Construction of the Project with such measures for water treatment will actually be an improvement on the current situation.

9.10.4 Comparing existing drainage to proposed drainage there will be a significant decrease in volumetric flow rate of surface water entering watercourses which will decrease the risk of surface water flooding to third parties. This is because the new discharge will be restricted to Greenfield discharge rates with attenuation up to and including the 1 in 100yr rainfall event plus an allowance for climate change.

9.10.5 CIRIA Report C609 provides guidance on maintenance and this will form the basis of the detailed maintenance strategy for agreement with the relevant stakeholders. This strategy will ultimately be compiled as an 'owners manual' covering planned, routine and emergency maintenance of the drainage features used in the scheme.

9.10.6 The drainage strategy will decrease the amount of water entering the watercourses as areas historically with unlimited discharge are to be restricted to Greenfield rates. The use of Sustainable Urban drainage will improve water quantity, decrease risk of flooding through storage of water and add improved benefit to biodiversity.

10. RESIDUAL EFFECTS

Flood Risk

10.1.1 The flood risk affecting the Project is primarily from tidal inundation. Climate change predictions suggest that there will be a gradual increase in sea levels over the lifetime of the Project. The flood risk within the study area will increase over time whether or not the Project is constructed.

10.1.2 Vertical alignment of the Project is above the IFM water levels. The carriageway will be supported on embankment and structures which will be within the flood zones and, partially, beneath flood water levels.

10.1.3 The supporting embankments and structures will need to be designed and constructed to take account of floodwater, flowing past or against the support features of the Project. There is a residual risk of damage caused by water action against the support features.

10.1.4 Management of the support features would necessitate regular inspection and the carrying out of maintenance so that the flood resistant designed features are retained. The management will be the responsibility of the Concessionaire for the Project.

Drainage

10.1.5 The drainage proposals presented attempt to make best use of sustainable drainage systems whilst taking account of the ground conditions present. Appropriate sustainable drainage features have been identified such as swales to control surface water run-off from the proposed highway. These features will be directed towards storage areas before discharge to watercourses and ditches at controlled (pre-development) flow rates.

10.1.6 The proposals seek to 'clean and polish' highway run-off before it enters the groundwater and watercourses in the area. There have been improvements in surface water quality in the area and the drainage proposals for the new scheme seek to maintain this improvement in water quality.

10.1.7 On the basis that drainage of the existing road network does not have any particular measures for addressing water quality, and the streams in the area are adversely affected by highway run-off, construction of a new road with such measures for water treatment will actually be an improvement on the current situation.

10.1.8 For the purpose of this report attenuation features are assumed to be balancing ponds, which remain dry during periods of low rainfall. These ponds are assumed to be approximately 1m deep, but will be reviewed at the detailed design stage. Alternative features may also be considered at this time such as the use of ponds with permanently wet areas or wetlands to enhance amenity and ecological value, or subterranean voids.

10.1.9 CIRIA Reports C609 and C697 provide guidance on the maintenance of drainage solutions and this will form the basis of the detailed maintenance strategy of the highway. This strategy will ultimately be compiled as an 'owners manual' covering planned, routine and emergency maintenance of the drainage features used in the scheme. The maintenance of the drainage associated with the Project will be the responsibility of the concessionaire.

10.1.10 The maintenance of the drainage associated with the Project would be the responsibility of the Concessionaire for the duration of the concession.

Flood Defence Consent

10.1.11 The crossing of a watercourse will require Flood Defence Consent from the EA, pursuant to the Land Drainage Act and the Water Resources Act, or consent from relevant the maintaining body (the Acting Mersey Conservator, the Council or Peel Holdings).

10.1.12 The Project will require crossing of the following bodies of water:

a. Stewards Brook
b. Bowers Brook
c. St Helens Canal
d. River Mersey
e. Manchester Ship Canal
f. Runcorn to Latchford Canal
g. Halton Brook
h. Bridgewater Canal

10.1.13 Although consent to cross a watercourse can be achieved, the flood risk associated with the physical entity crossing the watercourse is retained by the owner of the asset, in this case the concessionaire.

Service Diversion

10.1.14 The Project will coincide with public sewerage at several locations. There is provision within the New Roads and Street Works Act and the Water Industry Act to allow for the diversion of such assets. Nevertheless the design and construction of service diversionary works should take account of flood risk from sewage as a consequence of work undertaken.

10.1.15 Residual flood risk associated with the diversion of assets, particularly with water supply and sewerage, assets will be retained by the undertaker, United Utilities North West.

11. CONCLUSIONS

11.1 General

11.1.1 The Project would provide effective road connectivity for the Study Area and remove traffic congestion from the Borough. It would provide an opportunity to re-balance the transportation infrastructure and deliver sustainable transport and economic goals.

11.1.2 The chosen route of the Project has been optimised to take account of inter alia existing transportation routes, residential and commercial/industrial landuses and the estimated cost of delivery. Alternative routes have been previously considered and are reported in Chapter 5 of the ES.

11.1.3 The Project will be constructed primarily on the site of existing highway and industrial landuses. A section of highway will span the Mersey Estuary at high level.

Flooding

11.1.4 The Mersey Estuary has flooded in the past. The EA designated flood zones indicate that land to the north and to the south of the estuary floods due to tidal inundation. Sections of the Project will be constructed within the flood zones.

11.1.5 The net effect of the Project on flood risk is not significant. The level of current flood risk is predicted to remain unaltered following the proposed development. Indeed, the flood risk is predicted to decrease as a consequence of introducing sustainable drainage methods at several locations and by raising ground levels to support the highway.

11.1.6 It has been demonstrated that the fluvial and tidal flood depths at locations within the Study Area would be the same in comparing the current landuse and the constructed Project.

11.1.7 The effect of climate change is predicted to affect the depth of flooding within the Study Area. The Project has taken account of climate change over the lifetime of the asset. It has been demonstrated that the impact of climate change upon the study area would be the same whether the Project is constructed or not.

Drainage

Surface Water Drainage – Discharge to Watercourse

11.1.8 The proposed drainage scheme will include the attenuation of surface water runoff in excess of that which can be accommodated by existing bodies of water using by sustainable drainage methods of balancing ponds, oversized pipes or swales. The use of these methods is betterment over the existing surface water flow discharges to local watercourses.

11.1.9 The proposed surface water drainage scheme ensures that there is no increase in the risk of flooding within the study area and within the surrounding catchment.

Surface Water Drainage – Discharge to Highway Drainage

11.1.10 Sections of the existing highway will remain unaltered or will be remodelled to effectively reduce the carriageway area. The quantity of highway surface water runoff will be the same or less than the quantity generated by the existing highway.

Pollution Control

The proposed new highway drainage would incorporate measures to assist with the management of pollution incidents from the carriageway.

11.2 Sequential and Exception Tests

The Sequential Test

11.2.1 A sequential risk-based approach is used to determine the suitability of land for development in flood risk areas. This test is used to assist local planning authorities with their allocation of land for development, ensuring that potential development is moved as far as is reasonably possible to areas with a lower probability of flooding.

11.2.2 Most of the proposed alignment of the Project is located within Flood Zone 1, with the exception of the section to the north of the River, which lies within the Flood Zones 2 and 3 and the Bridge itself which is crossing the River.

11.2.3 The Project specific FRA has incorporated the outputs of the SFRA. The Council's SFRA was published in October 2007 and provides guidance on the preparation of policies and proposals in the Local Development Framework to a standard that will meet the EA's requirements. The Project is referred to in the SFRA within 'Other Development/Regeneration Priorities – Transport', but makes no specific reference to flood risk as, at the time of SFRA compilation, the route of the highway had not been finalised. Instead the SFRA defers to the site specific FRA.

11.2.4 In the absence of SFRA direction the IFM flood zones have been used for the sequential test. The section of the Project lying within Flood Zones 2 and 3 comprise the Bridge and the elevated approach spans. In accordance with Table D.2: Flood Risk Vulnerability Classification given in PPS25, the Project would be classified as 'Essential Infrastructure'. The Mersey Crossing Group has access to the results of the Department for Transport's Mersey Crossing Study, which had identified the 'Runcorn Gap' as the optimum river crossing area to provide additional road capacity. A number of alternatives were considered for the Project. Details of the alternatives considered and the decisions which led to the selection of a new crossing (as opposed to other transport solutions) and the route to be taken forward are provided in Chapter 5 of the ES for the wider sustainability benefits of the scheme. For the reasons set out in Chapter 5 of the ES it has been concluded that there are no reasonably available alternative sites in areas of lower probability of flood risk that would be appropriate for this type of development. On this basis and in accordance with guidance provided in Table D.3: Flood Risk Vulnerability and Flood Zone Compatibility, the Project should be subject to the Exception Test to determine whether it should be permitted, as it is partly within Flood Zone 3 and functioning floodplain.

The Exception Test

11.2.5 The Exception Test should be applied only after the Sequential Test has been applied and in the circumstances shown in PPS25 Table D.1 when 'more vulnerable' development and 'essential infrastructure' cannot be located in Zones 1 or 2.

11.2.6 PPS25 Section D9 defines three elements to the Exception Test:

Wider Sustainability Benefits

11.2.7 Wider Sustainability Benefits – Further to Section 1 of this Flood Risk Assessment, the Project would deliver sustainable benefit to the community. These benefits are:

a. To relieve the congested SJB, thereby removing a constraint on local and regional development and better provide for local transport needs;
b. To improve accessibility in order to maximise local development and regional economic growth opportunities;
c. To improve local air quality and enhance the general urban environment;
d. To improve public transport links across the River;
e. To encourage the increased use of cycling and walking;
f. To restore effective network resilience for transport across the River.

11.2.8 Further, there is not expected to be any detriment to flood risk as a consequence of the Project.

Previously Developed Land

11.2.9 Previously Developed Land – The majority of the project is within the footprint of existing highway routes or occupies land that is currently or has historically been used for industrial purposes. The sections of elevated highway within the Project are above saltmarsh. There are no reasonably available sites on developable previously developed land for these aspects of the Project.

Flood Risk

11.2.10 Flood Risk – It has been demonstrated in the Section 9 that the Project's drainage system would lessen the rate of discharge of runoff to local watercourses and would thus reduce flood risk. This is betterment over the existing land use.

11.2.11 Compliance with the Exception Test can be demonstrated. Development of the Project within Flood Zone 3 should therefore be permissible.

11.2.12 The Project has decreased the available flood storage area. This has had no discernable difference to flood risk.

Planning Policy Statement 25: Development and Flood Risk

11.2.13 Appendix C of the Living Draft presents an FRA pro-forma. It can be used to accompany a planning application for developments that require an FRA. This pro-forma has been completed for the Project based on the content of this FRA. It is presented below.

11.2.14 This FRA takes account of the requirements of PPS25. The FRA locates and describes the development, defines the flood hazard, assesses the probability of flood, identifies effect of climate change, reviews development plans, assesses off-site impacts and identifies residual effects.

PPS25 Living Draft Pro-Forma

11.2.15 The guideline document Development and Flood Risk: A Practice Guide Companion to PPS25 'Living Draft' (Communities and Local Government February 2007) Appendix C presents a "FRA Pro-forma". The intended use of the pro-forma is to assist with content of the FRA and the location of pertinent information. The completed pro-forma is presented as Table 11.1, below.

Flood Risk Assessment for New Development – Pro-Forma
1 Development description and location
1a. What type of development is proposed and where will it be located?
The type of development is delivering a new crossing of the river Mersey and linking the crossing with the existing road network. (Section 1.3.1)
1b. What is its vulnerability classification?
Essential Infrastructure (11.2.4).
1c. Is the proposed development consistent with the Local Development Documents?
The proposed development is consistent with the Local Development Documents. The local documents say a flood risk assessment in accordance with PPS25. This is the flood risk assessment (4.1.32).
1d. Please provide evidence that the Sequential Test or Exception Test has been applied in the selection of this site for this development type?
The Sequential Test and Exception Test have both been applied. Studies by Halton Borough Council and Secretary of Transport have shown a need for a second crossing of the Mersey. By the nature of a development a bridge will likely be in a flood plain as it crosses a river (11.2).
2. Definition of the flood hazard
2a. What sources of flooding could affect the site? (see Annex C PPS25).
Fluvial Flooding
Tidal Flooding
Flooding from Land
Flooding from Sewers
2b. For each identified source, describe how flooding would occur, with reference to any historic records wherever these are available.
Fluvial Flooding- Stewards Brook: The road crosses Stewards Brook. There is a potential that the culvert in which the watercourse passes through could block or not big enough. However there is no historical evidence of this happening (7.1.34). Fluvial Flooding – Bowers Brook: there is no historic record of flooding from this brook. However, the Project and adjacent are at risk from flooding (7.1.21).
Tidal Flooding- The Upper Mersey Estuary- There is a risk of flooding if the bridge is not elevated. (Paragraph 6.4.2)
Flooding from Land- The existing road around Stewards Brook cuts the brooks catchment in half. In intense rainfall events this could exacerbate the flooding in the field north of the road. However there is no evidence this has ever happened.
Flooding from sewers – there are no known instances of flooding from sewerage.
2c. What are the existing surface water drainage arrangements for the site?

The existing drainage for the existing roads is unrestricted discharge into the local watercourse (8.5.6 – 8.5.9).
3. Probability
3a Which flood zone is the site within?
The proposed development is in flood zone 1, 2 and 3 (8.2).
3b If there is a Strategic Flood Risk Assessment covering this site, what does it show?
Yes – SFRA dated October 2007 (4.1.35).
3c What is the probability of the site flooding taking account of the contents of the SFRA and of any further site-specific assessment?
The proposed development is going over an estuary therefore without mitigation the likelihood of flooding is 100%.
3d What are the existing rates and volumes of run-off generated by the site?
The existing rates are unrestricted, the new proposed discharge will be restricted to Greenfield rate and attenuation will be up to and including 1% storm event plus climate change (8.5.6 – 8.5.7).
4. Climate change
4a How is flood risk at the site likely to be affected by climate change?
Climate change will be accordance with PPS25 (7.1.19 – 7.1.20).
5. Detailed development proposals
5a Please provide details of the development layout, referring to the relevant drawings.
Please see figures 3.3 and B4027/4/FRA/2a to 2i for the general arrangement.
5b Where appropriate, demonstrate how land-uses most sensitive to flood damage have been placed in areas within the site that are at least risk of flooding.
The entire proposed development is a road, therefore the entire land uses are the same. (Paragraph 1.3.1)
6. Flood risk management measures
6a. How will the site be protected from flooding, including the potential impacts of climate change, over the development's lifetime?
The road and bridge will be raised above the existing flood levels including climate change (sections 8 and 9)
7. Off site impacts
7a How will you ensure that your proposed development and the measures to protect your site from flooding will not increase flood risk elsewhere?
There will be a reduction of tidal floodplain storage of 2,300m$^{3.}$ However volume is not significant because the volume available to a tidal flood within the Mersey Estuary is far in excess of that represented by land taken by the proposed scheme (8.3.4 – 8.3.15).
7b How will you prevent run-off from the completed development causing an impact elsewhere?
The run off will be restricted to Greenfield run off rate in new impermeable area. Which is above the national

guidance. In these areas there will be storage for up to and including the 1% event plus a further 20% volume for climate change (9.3.9).
8. Residual risks
8a What flood-related risks will remain after you have implemented the measures to protect the site from flooding?
Residual effects discussed in Section 10.
8b How, and by whom, will these risks be managed over the lifetime of the development? Development and Flood Risk: Consultation on a Practice Guide Companion to PPS25
The Concessionaire for the duration of the concession (10.1.10).

Table 11.1 – PPS25 Pro-forma

FIGURES

APPENDICES

APPENDIX A

Watercourses in the Area

APPENDIX B

Historic Flood Map

APPENDIX C

EA Flood defences Map

APPENDIX D

Fluvial Flood Levels J Flow Results

APPENDIX E

EA Indicative Flood Map (Flood Zone 2)

APPENDIX F

EA Indicative Flood Map (Flood Zone 3)

APPENDIX G

Existing Impermeable Areas and Proposed Impermeable Areas