THE MERSEY GATEWAY PROJECT

SURFACE WATER QUALITY

CHAPTER 8.0

SURFACE WATER QUALITY

C O N T E N T S

APPENDICES

8. SURFACE WATER QUALITY

8.1 Introduction

8.1.1 This chapter forms part of the Environmental Statement (ES) for the Project. This chapter reports the findings of the assessment of the potential effects of the Project on the surface water quality of watercourses which may be affected by the Project. The assessment discusses the potential effects associated with both the construction and operation phases of the proposed Project on the water environment.

8.2 Purpose of the Study

8.2.1 Given the location of the Project, across the Mersey Estuary (the 'Estuary'), surface water quality is an important consideration in assessing the potential effects of the Project on the environment, both because it forms a pathway through which any pollutants released could move to important receptors, such as the Special Protection Area (SPA), Ramsar Site, Site of Special Scientific Interest (SSSI) and European Marine Site downstream (refer to Figure 4.4 in Chapter 4 for their location), and because it forms a receptor in its own right.

8.2.2 Issues potentially associated with proposed construction activities, such as the release of unmanaged runoff and mobilisation of sediments from developments can have significant adverse effects that may degrade water quality, as well as hydrology and ecological status of watercourses.

8.2.3 The scope and objectives of this study are to:

a. Determine those watercourses which have the potential to be affected by the construction and operation of the Project;
b. Provide a baseline of the surface water quality for those watercourses which have the potential to be affected by the construction and operation of the Project;
c. Assess the likely significant effects to surface water quality for those watercourses which have the potential to be affected by the construction and operational phases of the Project;
d. Provide relevant information (a baseline) about water quality for the ecological assessment;
e. Where significant effects are identified recommend suitable mitigation, compensation or enhancement measures to reduce the level of effect; and
f. Recommend any monitoring requirements where appropriate.

8.2.4 This chapter has relied on information from and informs other environmental investigations and studies undertaken as part of the Project. These include:

a. Hydrodynamics and Estuarine Processes for effects on channel location, erosion and sedimentation, including resedimentation and movement of potentially contaminated sediments;

b. Aquatic Ecology for data on aquatic ecological resources and their sensitivity/importance; and
c. Contamination of Soils, Sediments and Groundwater for data on sediment contamination.

8.2.5 These investigations are discussed in separate chapters of this ES (Chapters 7, 11 and 14 respectively).

8.2.6 The effect of the Project on the hydrodynamics of the Estuary and the natural processes associated with the Estuary (such as tidal movements) have the potential to affect surface water quality through, for instance, the re-suspension of sediments from the bed of the Estuary. The construction of the New Bridge in the Estuary also has the potential to result in changes in the location for erosion and suspension of sediments (see Chapter 7)

8.2.7 The water quality of a watercourse has an important influence on the biota (i.e. the micro and macro-organisms). Negative effects on algae and zooplankton due to water quality inevitably affects species further up the food chain. The abundance and diversity of aquatic species is directly related to water quality. Watercourses with a higher level of water quality generally feature species of higher abundance and diversity than a watercourse of poorer water quality (although it should be noted that other issues, such as the habitats present, erosion/sedimentation and river geomorphology also play a part).

8.2.8 The presence of contaminated land in or adjacent to watercourses can decrease surface water quality of watercourses where a linkage is present (such as through leaching of contaminants from areas of contaminated land or landfill into watercourses). This in turn can also affect the quality of groundwater. This is a pertinent issue for this Project, particularly in parts of Widnes where the Project route crosses former industrial areas or areas of landfill.

8.2.9 Groundwater and groundwater sources will not be considered within this chapter but are instead discussed as part of the Contamination of Soils, Sediments and Groundwater Chapter of this ES (Chapter 14). In addition to this, effects on ecological receptors have not been discussed in this chapter. Reference should be made to Chapters 10 and 11 (Terrestrial and Avian Ecology and Aquatic Ecology respectively) for effects on ecology.

8.2.10 The Environment Agency (EA) was consulted as part of the assessment to obtain their views and to gather information regarding surface water quality. Consultation was undertaken through the issue of the Mersey Gateway Report on the Scoping for the Orders and Applications EIA. This was also issued to a number of key stakeholders and organisations with an interest in the Project. No responses with regard to surface water quality were received.

8.2.11 Consultation was also undertaken directly with the EA in January 2002 and November 2006 to determine their views and to obtain baseline information. A copy of the correspondence is included in Appendix 8.1, with the main concern relating to the remobilisation of contaminants in the Estuary. Data received from the EA in the response to our consultation requests is included in the baseline section (Section 8.6) for each watercourse.

8.3 Study Area

8.3.1 A description of the Project is given in Chapter 2 of this ES and an outline of the key methods for its construction provided in the Construction Methods Report (CMR) at Chapter 2, Appendix 2.1. The extent of the Project works is shown on Figure 1.3 (Chapter 1, Appendix 1.1). The alignment of the Project commence at the A562 Speke Road where a toll plaza would be formed on land that is presently occupied by the highway and a disused golf course. The alignment then swings south to cross the Garston to Timperley Freight railway line, Victoria Road, the St Helens Canal and Widnes Warth Saltmarsh at the Estuary. The route then passes at high level over the Astmoor Saltmarsh, Wigg Island and the Manchester Ship Canal to reach the south bank before it crosses the Astmoor Industrial Estate to rejoin the existing highway network at the junction of the Bridgewater, Daresbury and Central Expressways. The Central Expressway through Runcorn would be upgraded to conform more closely to current highway design standards. The Central Expressway junctions at Lodge Lane and Weston Link would be modified to implement the change in traffic priority of the route. The northern access roundabout to M56 Junction 12 would be modified to improve traffic efficiency through the junction.

8.3.2 These structures and improvements have been grouped into defined works areas which are shown on Figure 2.1 (Chapter 2).

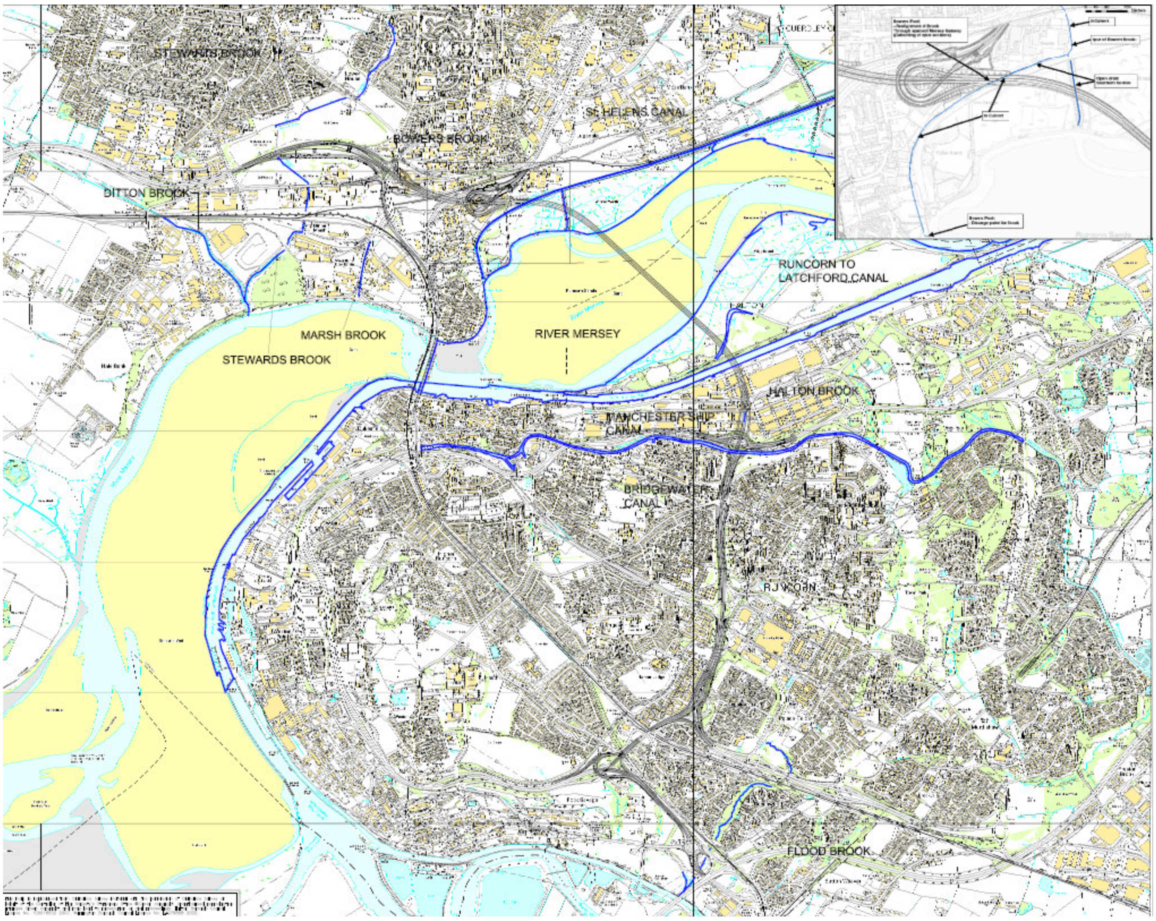
8.3.3 The scope of this assessment comprises two elements:

a. Compliance of the Project with National, Regional and Local Legislation, Policy and Guidance is assessed at Borough level; and

b. Physical and chemical effects resulting from the Project are considered at a more local level. The method used for defining this more local area is described below.

8.3.4 The location of each of the watercourses that lie within the study area is shown in Figure 8.1 and these are also considered in the Flood Risk Assessment (FRA), which contains relevant information for this assessment. The FRA also contains the drainage strategy for the Project. This is included at Appendix 8.2 of this chapter. The main potential effects on the water environment will result from works adjacent to or within the principal surface water bodies in the Project corridor. Therefore, Ditton Brook and Marsh Brook have been excluded from this assessment as they are remote from the proposed works.

Figure 8.1 - Watercourses Located within the Study Area



8.3.5 The study area for the surface water quality assessment has, therefore, concentrated on the principal water bodies located within the extent of the planning boundary of the Project (Figure 1.3, Chapter 1 Appendix 1.1). These water bodies are entitled "controlled waters" by the EA and are listed below (from north to south):

a. Stewards Brook;
b. Ditton Brook;
c. Marsh Brook;
d. Bowers Brook;
e. St Helens Canal;
f. The Estuary (specifically the Upper Mersey);
g. Runcorn to Latchford Canal (the "Latchford Canal");
h. Manchester Ship Canal;
i. Halton Brook;
j. Bridgewater Canal; and
k. Flood Brook.

8.3.6 The majority of the Project passes through a largely urban area which is drained by a system of ditches and surface water runoff systems. These feed into a number of principal watercourses, either directly or via storm drainage water collection systems. The extent of the study area therefore, is defined by the interactions of the proposed works (including works to the SJB and Widnes delinking) with the principal surface water bodies.

8.3.7 Because of the nature of the potential effects of the Project on watercourses the study area has been extended downstream along the principal watercourses. The extent to which the study area includes downstream areas is dependent upon the locations of EA monitoring stations the nature and scale of the effect and the interaction of this study with the hydrodynamics and estuarine processes study (Chapter 7).

8.3.8 A list of the key aspects of the Project affecting the watercourses, and their location in relation to the construction work areas in Figure 2.1 is given in Table 8.1.

Table 8.1 - List of Key Issues Affecting Water Courses

Water Body	Construction Works Area	Reason for Insertion
Stewards Brook	A	Works comprise widening of Speke Road which requires an extension of the existing culvert through which the brook flows.
		It is proposed that surface water drainage and road runoff will be discharged to the brook at a crossing point south of Speke Road.
Bowers Brook	C	Construction work will occur above and adjacent to the water course which will require work to extend the existing culvert through which the brook flows.
St Helens Canal	C	It is proposed that surface water drainage and road runoff will be discharged to the brook at a crossing point. In addition, construction work will occur above and adjacent to the watercourse.
		Works comprise construction within the water body in the form of temporary infilling to allow works access and permanent bridge abutment.
The Estuary (specifically the Upper Mersey)	D and I	Works comprise construction of three temporary cofferdams, a temporary piled jetty and three permanent bridge towers within the water body. In addition ecological mitigation works are proposed on the adjacent saltmarshes.
		Permanent reprofiling works to the SJB. No proposed changes to existing discharge locations, continued discharge into the Estuary from the SJB.
Latchford Canal	D	Construction works adjacent to and spanning the water body.
Manchester Ship Canal	E	Construction works adjacent to and spanning the water body.
Halton Brook	E	Construction works adjacent to and spanning the water body.
Bridgewater Canal	F	Construction works adjacent to and spanning the water body.
Flood Brook	H	Construction works adjacent to the water body.
		It is proposed that surface water drainage and road runoff will be discharged to the brook at a crossing point at Lodge Lane Junction.

8.3.9 From the above table it is evident that in addition to construction work adjacent to and spanning the watercourse, further work that potentially effects water quality is required at Stewards Brook, Bowers Brook, St Helens Canal and the Estuary. This is relevant to the methodology applied – for further details see Section 8.5.

8.3.10 As part of the Project there will be a requirement to discharge sewerage from the toll plaza areas to the existing foul sewage network. These are discussed further in the Flood Risk Assessment (Appendix 8.2).

8.4 Relevant Legislation and Planning Policy

8.4.1 Legislation and policies relevant to surface water quality has been examined and considered as part of this assessment.

National Legislation

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

a. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 (Ref. 1);
b. The Environment Act 1995 (Ref. 2);
c. The Water Resources Act 1991 (Ref. 3);
d. The Highways Act 1980 (Ref. 4); and
e. Dangerous Substances Directive (76/464/EEC) (Ref. 5).

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003

8.4.3 Water resources in the UK and throughout the European Union are managed through the Water Framework Directive (2000/60/EEC) (WFD). The WFD came into force in December 2000 and was transposed into UK law in January 2004 through The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The Directive provides a strategic and coherent framework for the sustainable use and management of water across the EU. Its implementation into UK law was a major step forward in the management of water quality, integrating water quality objectives into regional and local planning.

8.4.4 The principle aim of the Directive requires all inland and coastal water bodies to reach at least 'good' status by 2015. For surface waters the specific objectives of the WFD are:

a. The achievement of good ecological status and good surface water chemical status by 2015;
b. The achievement of good ecological potential and good surface water chemical status for heavily modified water bodies and artificial water bodies;
c. Prevention of deterioration from one status class to another; and
d. Achievement of water related objectives and standards for protected areas.

8.4.5 The competent authority for implementation of the WFD for England is the EA. In the UK water bodies include all 'controlled waters'. Controlled waters are defined as "*territorial waters…which extend seawards for three miles…, coastal waters…, inland freshwaters, that is to say, the waters in any relevant lake or pond or of so much of any relevant river or water course as is above the freshwater limit, and ground waters, that is to say, any waters contained in underground strata*" (Water Resources Act, 1981). This definition confirms that all the water bodies (including the Estuary) within the study area can be considered to be 'controlled waters' under the Water Resources Act. Under the WFD the following are required to be undertaken by the competent authority:

a. Characterise river basin districts;
b. Establish a register of protected areas;
c. Establish monitoring programmes;
d. Set appropriate environmental objectives; and
e. Prepare River Basin Management Plans (by 2009).

8.4.6 The Project is located within the 'North West River Basin District'. Under the requirements of the Directive a management plan for each river basin district is currently being produced with a view to meeting the objectives of the WFD by 2015. To date only a summary report characterising the North West River Basin District has been produced (DEFRA/EA, 2005) (Ref.

6). The River Basin Management Plan for the North West is currently being prepared and is programmed to be issued in 2009. No information on the policies which will be contained in this plan are currently available. However, this is considered further below.

8.4.7 It should be noted that currently the criteria for good ecological and chemical status in surface waters under the WFD have not been finalised. These are to be finalised as part of the River Basin Management Plans. Nevertheless, the WFD is relevant to the Project because its objective to improve water quality should not be undermined.

The Environment Act 1995.

8.4.8 The Environment Act 1995 introduced two main elements which potentially affect the Project in terms of the water environment. Firstly, it set up the EA which is the principle authority dealing with water quality in surface waters in the UK. Secondly it introduced a range of new powers which enable the EA to prevent remedy or prohibit any activities which have led or could lead to pollution taking place. This is through the issue of works notices, enforcement notices or prohibition notices.

The Water Resources Act 1991

8.4.9 Under the Water Resources Act 1991 it is an offence to knowingly pollute controlled waters in the UK. The EA are the statutory body responsible for regulating controlled waters under the Water Resources Act 1991.

8.4.10 Discharges to controlled waters must be approved by the EA to ensure that the quality of controlled waters is not adversely affected. Discharges for the Project will need to be agreed prior to construction, and the discharge monitored to ensure that it meets the quality criteria set by the EA.

The Highways Act 1980

8.4.11 The Highways Act 1980 gives the Highways Agency the right to discharge run-off from Motorways and Trunk Roads into inland, tidal or groundwaters but is subject to the Water Resources Act 1991 requirement not to pollute.

8.4.12 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 EA who determine 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 EA 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.

8.4.13 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 EA, who will use this, and associated legislation noted above, to control pollution and liquid emissions into surface waters.

National Policy Guidance

8.4.14 National Policy guidance relevant to surface water quality and the Project is contained in ‘Planning Policy Statement 23: Planning and Pollution Control, Annex 1 Pollution Control, Air and Water Quality’ (Communities and Local Government, 2004) (Ref. 7).

8.4.15 In addition to the above, ‘Planning Policy Statement 25: Development and Flood Risk, Annex E The Assessment of Flood Risk and Annex F Managing Surface Water’ (Communities and Local Government) (Ref. 8), is a National level document which relates to the water environment. However, it has no guidance on water quality issues, and so is not considered in this section.

This is, however, discussed in detail in the Project FRA, which is appended to this chapter as Appendix 8.2.

Planning Policy Statement 23 (PPS23: Planning and Pollution Control)

8.4.16 Planning Policy Statement 23 relates to the interaction between the planning system and the system by which pollution is controlled in the UK. Its Policies and Guidance are used by Regional Bodies in preparing Regional Spatial Strategies and Local Planning Authorities in preparing Local Development Document. Its guidance is also used by Local Planning Authorities in determining planning applications, and so is of direct relevance to the Project.

8.4.17 PPS 23 was published in 2004 and replaced an earlier document, Planning Policy Guidance 23 Planning and Pollution Control (PPG23).

8.4.18 PPS 23 includes a number of important elements relevant to the Project. These include:

a. The Precautionary Principle. This states that where there is a lack of data or scientific certainty of an effect occurring, this shall not be used as a reason for not requiring the use of cost effective pollution control equipment;
b. That potential effects on the water environment are a material planning condition; and
c. The relationship between planning and pollution control. In particular the PPS states that the planning system plays an important role in determining the location of a development and its interaction with other land uses, and that in considering planning applications, Local Planning Authorities should consider the risks from and of pollution and land contamination and how these can be managed or reduced. It also points out that the planning system should focus on whether the development itself is an acceptable use of the land, and the effects of those uses rather than the controls of processes or emissions themselves.

8.4.19 Appendix A of PPS 23 identifies the pertinent issues in determining individual planning Applications. These include:

a. The potential sensitivity of the area from pollution including surface waters;
b. The possible adverse effects on water quality from discharges from the development;
c. The need to make provision for suitable drainage of surface water from the development; and
d. Interaction with existing management plans, including river basin management plans.

8.4.20 Annex 1 of PPS 23 provides guidance on how the potential effect of development on water quality is controlled through the planning process. This primarily relates to Integrated Pollution Prevention Control (IPPC) licensed sites (which the Project is not) however, it gives some guidance to the Government's approach to the protection of water quality. The matters documented within Annex 1 which are considered to be relevant to the Project include:

a. The 'possible effect of potentially polluting development; and
b. Potential sensitivity of the area to adverse effects from pollution, in particular reflected in surface waters.'

8.4.21 These matters are considered to be appropriate for this assessment as the construction and operation of the Project has the potential to cause pollution of surface water. This is a material consideration in the assessment of the planning application for the Project.

Regional Policy Guidance

8.4.22 Regional Policy guidance relevant to surface water quality and the Project comprise the following documents:

a. Cheshire Environment Action Plan 2005-2020 (The Sustainable Cheshire Forum, 2005) (Ref. 9); and
b. Regional Planning Guidance for the North West (RPG13) (Government Office for the North West, 2003) (Ref. 10).

8.4.23 In addition to the above, the following draft regional policy documents are relevant to the development:

a. North West River Basin District - River Basin Management Plan;
b. The Mersey Estuary Catchment Flood Management Plan (Ref. 11); and
c. The Draft Regional Spatial Strategy for the North West, January 2006 and its Review (Ref. 12).

8.4.24 The North West District River Basin Management Plan covers the Mersey Catchment and will be prepared by the EA under the requirements of the WFD. It will provide a framework for the catchment upon which more detailed decisions can be made. The plans will provide a strategic long term management plan of the basin, identify objectives for the basin, generic measures to be adopted across the basin to meet the objectives and will act as the main mechanism for reporting progress towards the objectives to the European Commission.

8.4.25 The Plans are at a very early stage of development, and no specific information is currently available for the North West District/Mersey Basin. The first plans are due to be issued in December 2008, with the final versions of the plans being published in December 2009. However, the EA has published the first step in the process, the 'Summary of Significant Water Management Issues'. Key Issues relative to the Project are:

a. Diffuse pollution from roads and urban areas; and
b. Physical modification of rivers and coastline.

8.4.26 In terms of diffuse pollution from roads and urban areas, the document identifies the Mersey Belt as an area (in which the study area is located) where significant diffuse pollution of the surface waters occurs, and the road and rail sector as an important element in controlling pollution, particularly oil pollution.

8.4.27 In terms of physical modification of rivers and the coastline the plan identifies the River and the effect of the Manchester Ship Canal upon it as one of the major examples of river modification in the district. The document identifies several measures which could be considered to be put into place. Of these, only one, for urban planning opportunities that tackle issues caused by the physical modification of rivers (such as de-culverting and reconnecting development to the waterside), relate directly to the Project and water quality.

8.4.28 The document contains no specific actions, policies or plans, as these will be developed during 2008. Therefore, although the Plan will not be available to provide tests for the planning application, it will be a pertinent document that will have to be taken into account during the detailed design stages of the Project by the Concessionaire.

8.4.29 The Draft Mersey Estuary Catchment Flood Management Plan (EA, 2007) is a regional level document prepared by the EA which relates to the water environment. This is discussed in detail in the Project FRA, which is included in Appendix 8.2. The Plan primarily focuses on developing actions to sustainably manage flood risk in the Mersey basin (the 'catchment'). The aim of the plan is to enable the EA to deliver *"flood risk management in a way to maximise the opportunities to achieve wider benefits such as the environmental objectives for river basin districts"* (EA, 2007). The plan contains four catchment objectives and six major policies which have been developed by the EA and its partners, including the Local Authorities. Surface water quality is not mentioned in any of these objectives or policies, although it underlies and contributes to a number of these, such as protection of important cultural sites and improving amenity value of the catchment (both of these are stated objectives).

Cheshire Environmental Action Plan 2005-2020

8.4.30 The Cheshire Environmental Action Plan 2005-2020 contains action plans for key environmental themes such as water. The action plan for water quality, which is relevant to the development of the Project, states that it is their aim to *"maintain existing high standards for watercourses and achieve at least 'Class C' for the remainder by 2010"*.

8.4.31 'Class C' is defined as the water quality standard 'fair' under the EA's General Quality Assessment system. This is discussed further in Section 8.5 of this chapter.

Regional Planning Guidance for the North West (RPG 13)

8.4.32 RPG 13 develops and identifies the key development policies for the North West Region. This includes a number of quality of life and environmental policies, including those covering water quality and the protection of water resources. The overriding aim of RPG13 is to promote sustainable patterns of spatial development and physical change in the North West of England.

8.4.33 Policy ER7 covers water resources within the North West Region. It aims to protect and manage water supplies through sustainable development, including managing water demand, conserving supplies, reducing wastage and over abstraction ensuring sustainable patterns of development. In particular, the Policy requires new developments to be in areas where water resources are adequate. With reference to the Project, this policy only affects the construction stage because in the operation stage the Project will not be a significant user of water resources. During construction this policy may be applicable as water will be required for construction processes.

8.4.34 Water quality is covered by Policy EQ3 - Water Quality. The Policy includes provisions for promoting *"measures to improve and sustain the quality of the Regions rivers, canals and sea"*. Relevant measures for the Project include:

a. Maintaining or improving the quality of groundwater, surface or coastal waters;
b. Avoiding development that poses an unacceptable risk to the quality of groundwater, surface or coastal water;
c. Ensuring that adequate pollution control measures to reduce the risks of water pollution are incorporated into new developments; and
d. Ensuring that the construction of roads and other transport infrastructure does not unnecessarily add to diffuse pollution.

8.4.35 The explanatory notes to the policy explain the background to it. They note that:

a. Some rivers, particularly in the southern parts of the region, have become derelict and polluted by urbanisation;
b. 13% of the Regions water courses are classified as "Poor" or "bad", particularly in the Mersey Region; and
c. The Mersey Basin Campaign (an organisation which is dedicated to the improvement of the waters and watersides of the River) continues to deliver improvements in water quality and waterside regeneration.

8.4.36 RPG 13 was published in 2003, and the Halton UDP of 2005 will have taken account of its requirements in developing policies for the protection of the water environment.

The Draft Regional Spatial Strategy for the North West

8.4.37 Policy EMS from the Draft Regional Spatial Strategy considers Integrated Water Management. This policy states that *"Plans and strategies should have regard to River Basin Management Plans and assist in achieving integrated water management and delivery of the EU Water Framework Directive (WFD)".* It lists measures to protect the quantity and quality of surface, ground and coastal waters and manage flood risk. These include requiring new, and where possible, existing development (including transport infrastructure) to incorporate sustainable drainage systems and water conservation and efficiency measures.

Local Planning Policy

8.4.38 Local policy guidance relevant to surface water quality and the Project comprise the following:

a. Halton Borough Council UDP Adopted 7th July 2005 (Ref. 13); and
b. Emerging Local Development Framework for Halton (Ref. 14).

Halton Borough Council UDP and Emerging LDF

8.4.39 The Halton Unitary Development Plan (2005) provides the local policy framework for environmental protection, including policies aimed at the water environment.

8.4.40 Chapter 4 of Halton's UDP covers Pollution and Risk which includes water quality. The objectives outlined by Halton in this chapter are:

a. To reduce the potential of various land uses to cause continuing harm; and
b. To improve the potential to create a safe, healthy and prosperous economy, environment and society.

8.4.41 Part 2 of Chapter 4 in the UDP outlines the following policy relating to surface water quality:

PR5 Water Quality

8.4.42 "*Development will not be permitted if it is likely to have an unacceptable effect on the water quality of water bodies including rivers, lakes and canals or pose an unacceptable risk to the quality of groundwater*".

8.4.43 The justification notes for the policy state that there is a "*need to ensure that adequate pollution controls are incorporated into new developments to reduce the risks of water pollution*".

8.4.44 The Project will have to take into account this policy as it directly concerns the effects of development on water quality. The Project, in common with all major developments, has the potential to pollute surface water bodies both during construction or operation phases either as point (accidental release) sources, or as diffuse discharges. The ES and CMR will also have to demonstrate what aspects of the Project will be used to control effects of the Project on the water environment, and that the Project is appropriate for the location chosen in terms of surface water quality.

8.4.45 The Current UDP is in the process of being replaced by a new Local Development Framework (LDF). To date only the core strategies for the LDF have been produced. It is proposed that Supplementary Planning Documents will identify specific policies for pollution control and the water environment. However, these have not been produced to date. Given that the current UDP has been protected up to 2011, it is this document that will provide the basis upon which the planning application will be determined.

8.5 Assessment Methodology

8.5.1 The potential effects of the Project on the surface water environment have been assessed with regard to relevant tests provided in National Legislation and National, Regional and Local Policies. In addition, effects on the chemical quality of the river have been assessed at a more local level (see Section 8.3 for description of the study area).

8.5.2 The methodology for assessing compliance with relevant legislation and policy uses professional judgement to assess if the proposals and effects predicted meet or fail the tests provided in the relevant documents.

8.5.3 The chemical surface water quality assessment methodology has been carried out with regard to the methodologies set out in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 10; Water Quality and Drainage (Ref. 15). The DMRB has been specifically developed over the past 20 years by nationally respected experts working on behalf of the Highways Agency, and provides the most reliable, comprehensive and nationally accepted methodology for assessing the effects of road projects on the environment. However, in some areas the assessment has gone beyond that defined within the DMRB because the DMRB only considers specific elements of the assessment relevant to trunk road and motorway construction and operation, such as accidental spillages. Where this is the case, industry best practice has been used. The principles and appropriate methodologies are explained below.

8.5.4 The DMRB provides a methodology for predicting the potential effects of construction and operation of a proposed road project on the water environment. This includes possible effects on the quality of watercourses and the existing overall hydrology of catchment areas. Mitigation options that may be appropriate for consideration in respect of a given circumstance are required to be outlined for consideration, should the assessment predict potentially significant adverse effects upon the water environment.

8.5.5 The DMRB states that pollution effects from runoff during normal operating conditions on receiving waters appear to be restricted to roads carrying greater than 30,000 vpd Annual Average Daily Traffic (AADT), although the guidance can be relevant for roads carrying less than 30,000 AADT and should be applied when associated with runoff to sensitive water bodies or low flow water resources.

8.5.6 The DMRB document also provides methodologies for the assessment of pollution effects from routine runoff and accidental spillages from road users. This has been used as part of this assessment. These methodologies rely on a certain amount of data being available from the regulatory authority (EA) including the required environmental quality standard for each reach affected, the use of each reach, water quality data and flow data. For the Project this is only available for some of the principal watercourses within the study area. Where no data is available a conservative approach has been taken which reflects the nature of the watercourse. This will represent a worst case scenario with regard to the assessment.

8.5.7 As the WFD is still being implemented, water quality classification has been undertaken by using the existing EA General Quality Assessment (GQA) chemical grading, which is also specified within the DMRB, rather than the new classifications which will be introduced under the WFD. The GQA for rivers has been used for many years for water bodies that are predominantly freshwater and is a nationally accepted methodology. It grades water courses from A (Very Good) to F (Bad). For estuaries the GQA has been used for the water bodies that are predominantly saline. Estuaries are classified as “Good”, “Fair”, “Poor” or “Bad” based on chemical parameters. Both methods have been used for water bodies which are freshwater but have saline intrusion.

8.5.8 This chapter has also considered the potential effects of scour around the tower locations on the water quality of the Estuary. Potential effects of scour are discussed in the Hydrodynamics and Estuarine Processes Chapter (Chapter 7). Canadian Guidelines (Ref. 16) have also been used for an initial assessment of risk from sediment concentrations of toxic substances to organisms. This is consistent with the approach which has been undertaken to assess sediments within the Contamination of Soils, Sediments and Groundwater Assessment Chapter (Chapter 14).

Baseline Methodology

8.5.9 Baseline water quality has been established for all watercourses located within the study area. This has been undertaken to characterise and establish the water quality of the watercourse to enable an assessment to be undertaken of the potential effects of the Project on surface water quality. Where collected datasets allow, trends in water quality have been discussed.

8.5.10 Data has been collected from two sources:

a. Third party sources. This was principally the EA who have statutory responsibility for protecting England's surface water quality and undertake extensive water quality monitoring as part of this responsibility. The benefit of this data is that it is collected using standardised sampling, transport, storage and analysis methods and sampling usually has been undertaken over many years in controlled waters. This means that the datasets on different water bodies are consistent and trends and statistical analysis can be undertaken on the dataset. In addition to the EA data, data from the Council, undertaken during sampling of Stewards Brook and the Latchford Canal, has been collected. This uses standard techniques, but represents a "spot sample" as limited sampling over time was undertaken; and
b. Data was collected as part of the Project. These data have been collected either because EA data was not available, was too old, or EA sampling locations were too remote from the location of the Project. These datasets comprise spot samples or sampling over limited time period. This means that the data could not be subject to the same analysis as the GQA data. However, the data provides useful information on water quality where EA and other third party data was not available, and therefore allows derivation of a baseline upon which assessment of effects can be based.

8.5.11 The components of the baseline assessment and how they have derived is described below. Data on each watercourse is provided in Section 8.6 under the following headings (where the relevant data is applicable):

a. Watercourse Description;
b. Abstractions and Discharges
c. EA Data;
d. The Council's Data;
e. Gifford Data; and
f. Analysis of Data.

Description of the Watercourse

8.5.12 A physical description of the watercourse has been included as part of the baseline. This includes the location of the watercourse, its proximity to the Project and a description of how the Project interacts with that particular watercourse. This information has been obtained through the use OS mapping, site visits undertaken between 2004 and 2007 and a review of the CMR (Appendix 2.1, Chapter 2).

8.5.13 A list of all the current licensed abstraction and discharge consent information has been included to determine what, if any, usage is made of the water within the watercourse or if the watercourse is a receiving body for a discharge of water or other liquid (such as sewage, effluents etc). This information has been obtained from a company which supplies publicly available environmental database information, Landmark Envirocheck. The registered point of the abstraction or discharge on the watercourse is given from the closest point of Project along with the company which the abstraction or discharge is registered to. The nature of the abstraction/discharge is also given.

Chemical General Quality Assessment (EA)

8.5.14 A review of the EA GQA data for each watercourse was undertaken to characterise the chemical qualities of the watercourse. This was undertaken by using the chemical GQA information available from the EA website (Ref. 16).

8.5.15 The chemical GQA uses three chemical parameters to determine the water quality of a watercourse; dissolved oxygen, BOD and ammonia concentrations. The chemical GQA is designed to provide an accurate and consistent assessment of the state of water quality and changes in state over time. These chemical parameters are used because they are indicators of pollution; BOD is used for the detection of pollution from sewage whilst aquatic organisms are sensitive to ammonia and decreased dissolved oxygen.

8.5.16 The chemical GQA uses one of six grades (A – F) where grade 'A' is 'very good' through to grade 'F' which is 'bad'. The EA use the same defined procedures, throughout England and Wales, to characterise the water quality of watercourses.

8.5.17 Samples are taken for predetermined 'reaches' of the watercourses (a 'reach' being a length or part of a watercourse). The reaches and watercourses monitored are determined by the EA. The EA take samples from these reaches which are analysed by accredited laboratories. Samples are undertaken on a monthly basis for each length of a watercourse and are sampled a minimum of 12 times per year. This data is grouped in three yearly intervals (a minimum of 36 monthly sample events is required).

8.5.18 The EA do not sample every watercourse in the UK as they do not have the funding or resources to do so. Therefore, they sample watercourses which are either considered to be most at risk from pollution or those which are considered to be sensitive to changes in water quality.

8.5.19 Based on the chemical test results the percentiles are calculated using the method of moments, assuming a normal distribution for dissolved oxygen and lognormal for BOD and ammonia. The estimates of the percentiles are compared with the standards in Table 8.2, and a grade assigned to each length of watercourse according to the worst determinand. This is the 'face value' grade.

Table 8.2 - Standards for the EA Chemical GQA

GQA Grade	Dissolved Oxygen (% saturation) 10-percentile	Biochemical Oxygen Demand (mg/l) 90-percentile	Ammonia (mgN/l) 90- percentile
A - Very Good	80	2.5	0.25
B – Good	70	4	0.6
C - Fairly Good	60	6	1.3
D – Fair	50	8	2.5
E – Poor	20	15	9.0
F – Bad	<20	-	-

8.5.20 The EA have characterised the likely uses and status of the water quality corresponding to the chemical GQA grades. These are shown in Table 8.3, and have been used to identify where predicted water quality may conflict with established uses.

Table 8.3 - Characteristics of the EA Chemical GQA Grades

Chemical Grade		Likely Uses and Characteristics
A	Very Good	All abstractions Very good salmonid fisheries Cyprinid fisheries Natural ecosystems
B	Good	All abstractions Salmonid fisheries Cyprinid fisheries Ecosystems at or close to natural
C	Fairly Good	Potable supply after advanced treatment Other abstractions Good cyprinid fisheries Natural ecosystems corresponding to cyprinid fisheries
D	Fair	Potable supply after advanced treatment Other abstractions Fair cyprinid fisheries Impacted ecosystems
E	Poor	Low grade abstraction for industry Fish absent or sporadically present, vulnerable to pollution Impoverished ecosystems
F	Bad	Very polluted rivers which may cause nuisance Severely restricted ecosystems

8.5.21 Data collected from the EA website covering the years 2001 to 2006 has been assessed to establish current water quality. The grade assigned to the water body is the lowest grade achieved in any of the three water quality parameters in the most recent results. No data later than 2006 was available from the EA.

8.5.22 Because the EA do not monitor all of the watercourses in the UK all of the time there is a requirement to statistically analyse the results to eliminate any uncertainty over the grades and to determine confidence. This is particularly necessary when a watercourse is borderline between two grades or there has been an upgrade or downgrade of the monitoring results. The EA use a computer model called 'CONCLASS' to provide the statistical confidence of the results which looks at the mean, standard deviation, 90th percentile to determine the confidence of the results.

8.5.23 Data between 2001 and 2006 has been assessed to establish current water quality as no data later than 2006 was available. The grade assigned to the water body is the lowest grade achieved in any of the three water quality parameters in the most recent results. The chemical GQA information for each watercourse in the study area is included as part of the baseline section of this chapter. It should be noted that no chemical GQA information was available for the Latchford Canal, Halton Brook, or Flood Book as the EA do not monitor these watercourses. Therefore, alternative information has been obtained for these watercourses where required.

Other Data Sources

8.5.24 Data on water quality has been collected as part of the Project where EA or other third party data has not been available. This is shown in Table 8.4:

Table 8.4 - Additional Surface Water Collected from Third Parties and as part of the Project

Water Body	Location and reason
Stewards Brook	EAC Data produced for the Council as part of a study of the effects of contamination from the former St Michaels golf course on the water in the Brook and to prove a causal link between the two.
The Estuary (specifically the Upper Mersey)	Collected as part of the Aquatic Ecological Studies to provide data comparative to macro and micro invertebrate numbers such that water quality influences on species abundance or diversity could be assessed.
The Estuary and Bowers Brook	Additional data required for these water bodies to enhance third party data
Latchford Canal	Data was obtained from ecological reports undertaken by the Council which included limited chemical water quality data of the Latchford Canal.

Note: Water samples were not able to be collected from Halton Brook as there was no water in this watercourse during the sampling period.

8.5.25 The investigation of the Estuary is based on a number of sample locations, the data from which has been interpolated to establish a baseline for the water body comprising the Estuary. It is considered that the sample points used to provide data to inform this assessment are representative of the water body as a whole. By combining the data there is considered to be a representative spread of sample points across the study area and through the water column. EA monitoring data from upstream and downstream of the study area was also analysed to place the established baseline within the context of a wider area, outside the study area defined for this chapter in Section 8.3 above.

8.5.26 The datasets obtained from the EA, other third parties and the Project have been checked to ensure that they are compatible with one another.

8.5.27 The temporal coverage of the datasets is sufficient to produce an acceptable baseline for water quality. Trends in water quality have been identified by analysing EA data from, where available, 1978 to present day. Therefore, any baselines that are established can be viewed within the context of these overall trends. The EA produces water quality assessments over three year periods. To establish the current water quality baseline of watercourses within this chapter six years worth of data was considered, from 2001 to 2006.

8.5.28 Within the Estuary the amalgamation of the Project data sets produced 8 sets of results which extended over a one year period. When considered alongside the EA data for which sampling is undertaken on a monthly basis, this was considered sufficient to establish the water quality baseline considering the temporal variability of the estuarine environment.

8.5.29 Monitoring data has been primarily reviewed in comparison to the following thresholds; alternative guidelines have been used where appropriate:

a. EA GQA: Chemistry, applicable to dissolved oxygen, BOD and ammonia;
b. EA EQS, for both freshwater and saltwater;
c. Canadian sediment guidelines, applicable to heavy metals and PAHs within contaminated sediments; and
d. DMRB Method for assessing pollution effects from accidental spillages.

8.5.30 The DMRB guidance has been used as it is an accepted method of assessing and managing the effects that road projects may have on the water environment. This methodology includes possible effects on the surface water quality of watercourses.

Canadian Guidelines for Estuary Sediments

8.5.31 The potential effects of scour from the tower locations on the water quality of the Estuary have also been investigated as part of this ES. This is an important aspect as scour could release pollutants into the downstream aquatic environment, which is protected. Potential effects of scour are discussed in the Hydrodynamics and Estuarine Processes Chapter of this ES (Chapter 7).

8.5.32 The effect on water quality of potentially contaminated sediments released into the water column through scour action from the New Bridge structure has been assessed. There are no standards for sediment quality in the UK with respect to ecological risk in an estuarine environment.

8.5.33 In the absence of any UK standards, the "Guidelines for managing water quality effects within UK European marine sites" (Ref. 17) recommends using Canadian Guidelines to make an initial assessment of risk from concentrations of toxic substances in sediments to the organisms that would be expected to inhabit the estuarine environment. From direct measurement of toxicity of sediments to a range of aquatic organisms, threshold Interim Sediment Quality Guidelines (ISQGs) and Probable Effect Levels (PELs) were developed. The ISQG values are derived as a level at which effects may be observed in some sensitive species, whereas the PEL is likely to cause adverse effects in a wider range of organisms. The use of these parameters is discussed as part of the study undertaken on the sediments in the Estuary which is documented in the Contamination of Soils, Sediments and Groundwater Chapter (Chapter 14).

8.5.34 The Canadian Guidelines and the derived ISQGs and PELs have been used in this assessment. This is consistent with the approach which has been taken to assess sediments within the Contamination of Soils, Sediments and Groundwater Chapter (Chapter 14).

Environment Quality Standards

8.5.35 Environmental Quality Standards (EQSs) are concentrations of determinands that are standards used to assess the risk of chemical pollutant effects on water quality to the health of aquatic plants and animals. These standards have been derived under the Dangerous Substances Directive (76/464/EEC) and are divided into groups based on their severity. List 1 substances comprise of substances with an EQS value for freshwater and saline waters. These comprise:

a. Organohalogen compounds;
b. Organophosphorous compounds;
c. Organotin compounds;
d. Substances which possess carcinogenic, mutagenic or tetragenic properties;
e. Mercury and its compounds;
f. Cadmium and its compounds;
g. Mineral oils and hydrocarbons; and
h. Cyanides.

8.5.36 These are considered to be the most dangerous substances and should be prevented from being discharged into groundwater under the Directive.

8.5.37 List 2 substances comprise a list of substances which, whilst not classed as severe as List 1 substances, still pose a threat to the aquatic environment and discharges of these substances should be minimised. These comprise:

a. Zinc;
b. Copper;
c. Nickel;
d. Chrome;
e. Lead;
f. Selenium;
g. Arsenic;
h. Antimony;
i. Molybdenum;
j. Titanium;
k. Tin;
l. Barium;
m. Beryllium;
n. Boron;
o. Uranium;
p. Vanadium;
q. Cobalt;
r. Thallium;
s. Tellurium;
t. Silver;
u. Biocides;
v. Substances which have a deleterious effect on the taste/odour of groundwater;
w. Toxic or persistent organic compounds of silicon and substances which may cause the formation of such substances in water;
x. Inorganic compounds of phosphorous;
y. Fluorides; and
z. Ammonia and nitrates.

8.5.38 These have been used in this assessment for specific watercourses where further assessment of the potential effects of water quality is required. Chemical test data (where applicable) has been compared against the relevant EQS values for the substances on both lists to determine whether any watercourses exceed any of the EQS values.

DMRB Method for assessing pollution effects from accidental spillages

8.5.39 This method provides an indication of the risk of an accidental spillage causing a pollution impact on receiving watercourses. The risk is defined as the probability that there will be an accidental spillage of a pollutant and that the pollutant will reach and impact the water body to such an extent that a serious pollution incident occurs. The risk is expressed as the probability of an incident in any one year. This method has been used to assess the potential for accidental spillages pollution effects on watercourses with discharges from the road network only. This is because the drainage design for the Project only discharges to a limited number of watercourses.

8.5.40 To determine the annual probability a spillage accident the formula is used:

$$\mathbf{P_{ACC} = RL \times SS \times (AADT \times 365 \times 10\text{-}9) \times (\%HGV/100)}$$

8.5.41 Where:

a. P_{ACC} = annual probability of an accidental spillage with the potential to cause a serious pollution incident;
b. RL = road length in kilometres;
c. SS = spillage rates as specified in the DMRB;
d. AADT = annual average daily traffic for the design year (as obtained from the transportation assessment; and
e. %HGV = percentage of heavy goods vehicles.

8.5.42 From this the predicted annual probability of a serious pollution incident is calculated using the formula:

$$\mathbf{P_{INC} = P_{ACC} \times P_{POL}}$$

8.5.43 Where:

a. P_{INC} = the probability of a spillage accident with an associated risk of serious pollution risk of a serious pollution incident occurring; and
b. P_{POL} = the probability, given an accident, that a serious pollution incident will result. A factor from the DMRB has been used representing the fact that the Project is located in an urban location.

8.5.44 The DMRB states that the watercourses should be protected so that the risk of an accidental spillage occurring has an annual probability of less than 1%.

Methods for the Identification and Assessment of Effects

8.5.45 Potential effects to water bodies (receptors) were characterised using the effect criteria shown below. These set out how the magnitude, importance and significance of effects have been assessed in terms of water quality.

8.5.46 The DMRB has defined criteria for determining significance of effects, including criteria for determining the importance of a watercourse and the magnitude of effect. However, this approach has been modified as part of this assessment as it differs from the terminology and approach used to determine the significant of effects for other assessments of the Project. However, the same criteria used in the DMRB has been used in the new assessment but has simply had the ratings redefined to allow them to be consistent with other assessments used. The approach used as part of the Project has been used to ensure consistency in terminology between the chapters of the ES and is no less effective in measuring significance than the DMRB criteria.

8.5.47 Potential effects on receptors were characterised using the following:

a. Status of the effect, positive or negative;
b. Duration of the effect (short/medium/long term);
c. Permanent or temporary effect;
d. Direct or indirect effect;
e. Magnitude of the effect (low/moderate/high);
f. Importance of the receptor (low/moderate/high); and
g. Significance (low/moderate/high or not significant).

8.5.48 The status of the effects was assessed by considering whether the Project will have a positive or negative effect on the receptor (i.e. surface water quality of a watercourse). In assessing the effect on surface water quality of watercourses in the study area the likely length of time of the impact has been considered. These have been defined as the following timescales:

a. Short Term – 0 - 40 months;
b. Medium Term – 40 months - 10 years; and
c. Long Term – more than 10 years.

8.5.49 Permanent effects have been regarded as those which are not reversible and will last beyond the lifespan of Project. Temporary effects are those that are reversible or that cease to be an issue at some point during the Project's lifecycle. Direct and indirect effects have also been identified. Direct effects on receptors arise from the integral effects associated with the Project. An indirect impact is an effect which arises as a result of another effect on the Project.

8.5.50 A description has been provided as to whether the magnitude of the impact is high, moderate or low, with regard to its potential for causing either negative or positive effects. The criteria used in assessing the magnitude of the impact are shown below in Table 8.5.

Table 8.5 - Criteria to Determine the Magnitude of Effect on the Receptor

Rating	Criteria Threshold
Low	There will be minor effects resulting in a beneficial/detrimental effect as a result of the Project. For example the effect will result in measurable change in surface water quality or vulnerability. For example the calculated risk of pollution from accidental spillages between >0.5% and 1% annually.
Moderate	There will be effects resulting in a moderate beneficial/detrimental effect as a result of the Project. For example the effect will result in an effect on integrity in surface water quality For example calculated risk of pollution from accidental spillages >1% annually and <2% annually.
High	There will be major effects resulting in a moderate beneficial/detrimental effect as a result of the Project. For example the effect will result in the loss of a watercourse or integrity in surface water quality. For example calculated risk of pollution from accidental spillages >2% annually.

8.5.51 The criteria used in assessing the importance of the receptors are shown in Table 8.6. Again a scale of low, moderate or high has been used.

Table 8.6 - Criteria to Determine the Importance of the Receptor

Rating	Criteria Threshold
Low	Watercourse has surface water quality of low quality on a local scale. Water quality has a chemical GQA grade of E or F.
Moderate	Watercourse has surface water quality of moderate quality on a local scale. Water quality has a chemical GQA grade of C or D.
High	Watercourse has surface water quality on regional or national scale. Watercourse has a chemical GQA grade of A or B, a designated salmonid/cyprinid fishery, has species or areas designated under EU or UK wildlife legislation.

8.5.52 The significance of the effect has been assessed by considering the importance of the receptor and the magnitude of the impact. This has been derived from the baseline data, consultations and professional judgement to determine the level of significance of the impact.

8.5.53 For example, if the predicted change in water quality could lead to the loss of a fishery, this would be of high magnitude i.e. a complete loss, but may be of relatively low importance if the fishery was of poor quality. The overall significance of the effect would then be set at slight to moderate for the purpose of the overall assessment of the effects on water quality.

8.5.54 The following phases of the Project have been considered as part of the assessment:

a. Construction phase; and
b. Operation phase.

8.5.55 A 'do-nothing' scenario has not been considered as part of the assessment. If the Project is not constructed any effects in the future on surface water quality of the watercourses within the study area will be due to other changes to the established baseline such as discharges from other developments or initiatives to improve water quality. For the purposes of the assessment it is assumed that the 'do-nothing' scenario is the same as the baseline established in Section 8.6.

Methods for the identification of Mitigation and Enhancement Measures

8.5.56 Appropriate mitigation measures were identified as part of the assessment. These measures would reduce the significance of the effect of the Project on the identified receptors. The scale of the mitigation has been based on the 'mitigation hierarchy' as shown in Table 3.2, Chapter 3.

8.5.57 Where appropriate, enhancement opportunities have been suggested to improve surface water quality interests in the area. The effects were then reassessed with mitigation to determine whether any residual effects are present.

Baseline and Results of Investigations

8.5.58 This section describes the baseline quality of surface water bodies in the study area. It uses data from third parties, primarily the EA, but also data provided by the Council from other studies carried out in the recent past in the study area. Where insufficient existing third party data was available, surveys have been undertaken for this ES, either directly for work in the surface water chapter, or for work reported in other chapters, such as the Aquatic Ecology Chapter (Chapter 11). The work undertaken directly for the Project has been undertaken over a relatively short period, especially when compared to the data from the EA. However, it provides significant and useful examples of water quality in specific water bodies.

8.5.59 The description of the baseline quality of surface water is organised such that each water body, within the study area, from north to south, is described in turn. Ditton Brook and Marsh Brook have been excluded from this surface water quality assessment because they are not located close to works that will affect water quality. Each begins with a short description of the watercourse, including its location, abstractions from and discharges to the water body, its source and nature. Data from third parties is then presented followed by any data collected during the Project. The description concludes with an analysis of the surface water quality in that water body, and any trends evident in the data.

Stewards Brook

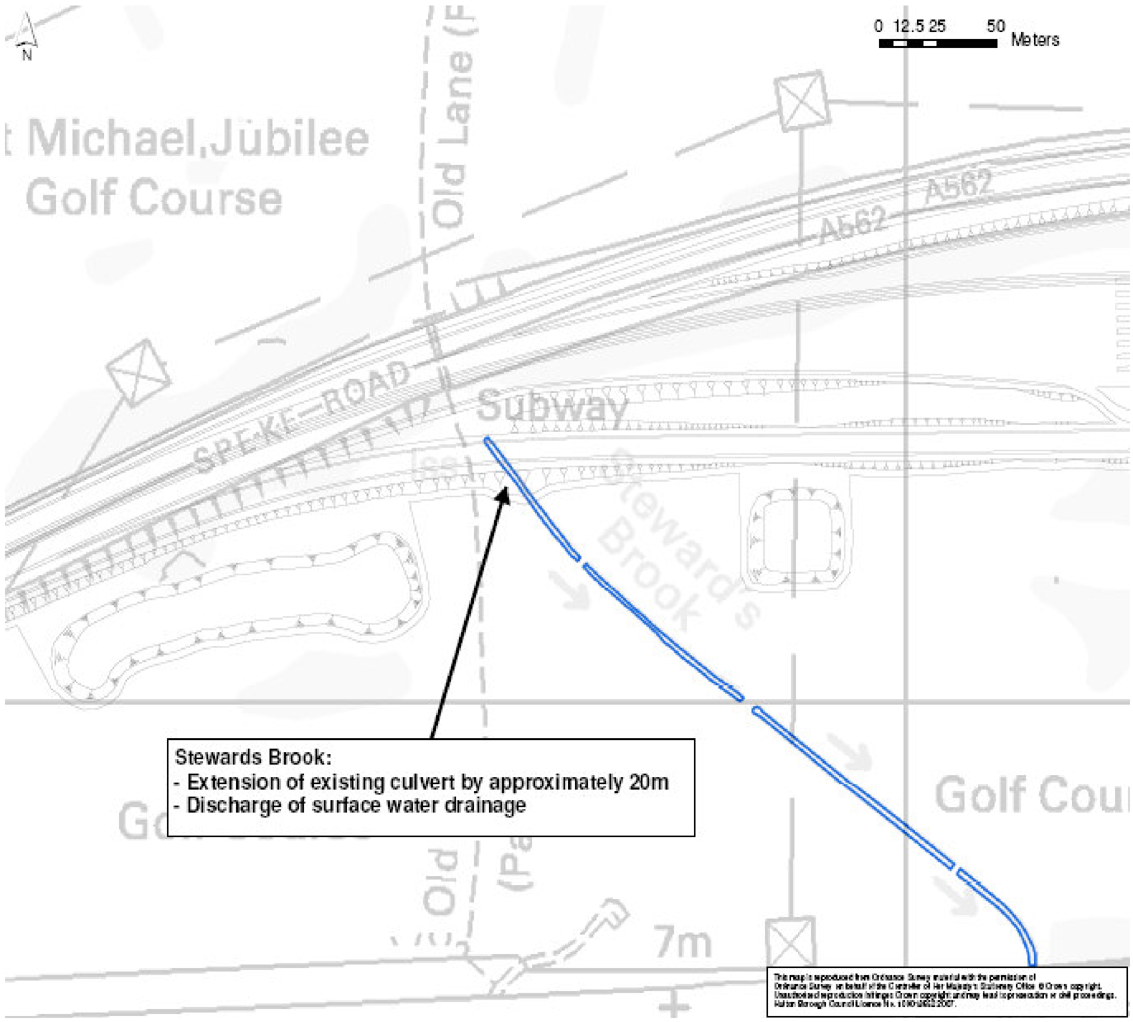
Watercourse Description

8.5.60 Stewards Brook is located in Widnes and has its source at a point marked as 'issues' on the OS mapping of the area. The OS defines an 'issue' as 'a stream that emerges from underground'. The source is located at OSNGR 350731E 386352N at a point 1.5km north east of the main toll plaza of the Project. Stewards Brook flows in a natural channel in a south westerly direction until it reaches the former St. Michaels Golf Course, where it flows southwards through a culvert beneath the existing A562 Speke Road.

8.5.61 Stewards Brook then flows southwards out of the culvert at OSNGR 349821E 385104N and is approximately 3m wide within the scheme boundary.

8.5.62 It is proposed to widen the A562 Speke Road in the location where Stewards Brook passes beneath the road to enable a toll plaza and spur road to be constructed. The spur road will link the toll plaza to the A533 SJB. The location of the Project in relation to Stewards Brook is shown in Figure 8.2.

Figure 8.2 - Stewards Brook



8.5.63 Stewards Brook flows into Ditton Brook 1km south of the main toll plaza of the Project. Ditton Brook in turn flows into the River at OSNGR 349569E 383899N. Stewards Brook is approximately 3.3km in length.

8.5.64 The CMR (Appendix 2.1, Chapter 2) states that, in order to increase the width of the existing carriageway, it will be necessary to extend the existing Stewards Brook culvert by approximately 30m. The culvert extension is proposed to be constructed of precast concrete segments. This will involve some excavation of potentially contaminated material which is buried beneath the former St. Michaels Golf Course. The nature of the contamination is discussed in Chapter 14.

8.5.65 The Council have stated that Stewards Brook at this location is currently lined with a cut-off wall constructed from gypsum and a HDPE (High Density Polyethylene) liner to minimise leaching of contaminants from the golf course into Stewards Brook.

8.5.66 It is also proposed to construct two balancing ponds to the south of the new carriageway on either side of Stewards Brook. These will accept surface water runoff from the new carriageway and will be used to control the drainage outfall rate into Stewards Brook.

8.5.67 Stewards Brook is located within construction area ‘A’, the ‘Main Toll Plaza’ Figure 2.1, Chapter 2.

Abstractions and Discharges

8.5.68 There are no registered current abstraction licenses for Stewards Brook.

8.5.69 Current registered discharges into Stewards Brook which are covered under discharge consents issued by the EA are listed in Table 8.7.

Table 8.7 - Discharge Consent for Stewards Brook

Operator	Distance and Bearing From Site	Discharge Type
United Utilities Plc	298m North West	Discharge of other matter – surface water
Feralco (UK) Ltd	301m South	Trade Discharge – Process Water
Feralco (UK) Ltd	306m South	Trade Discharges – Cooling Water
Feralco (UK) Ltd	351m South	Trade Discharge – Process Water
McKechnie Chemicals Ltd	410m South	Trade Discharge – Process Water
Alcan Aluminium UK Ltd	448m South West	Sewage Discharges – Final/Treated Effluent – Not Water Company
Alcan Aluminium UK Ltd	494m South	Septic Tank
Marsh Maintenance Ltd	790m South	Sewage Discharges – Final/Treated Effluent – Not Water Company

8.5.70 The above data obtained on discharge consents was obtained from Envirocheck and indicates that discharge consents into Stewards Brook and other watercourses in the study areas are stated as being 'post National Rivers Authority Legislation where issue date >31/08/1989'. The EA have stated that this means that these are current consents unless they have been subsequently revoked[1]. As there is no record that they have subsequently been revoked they have been assumed as being current consents for the purpose of this assessment.

Chemical Water Quality

EA Data

8.5.71 There are two EA water quality monitoring points located within Stewards Brook. These are:

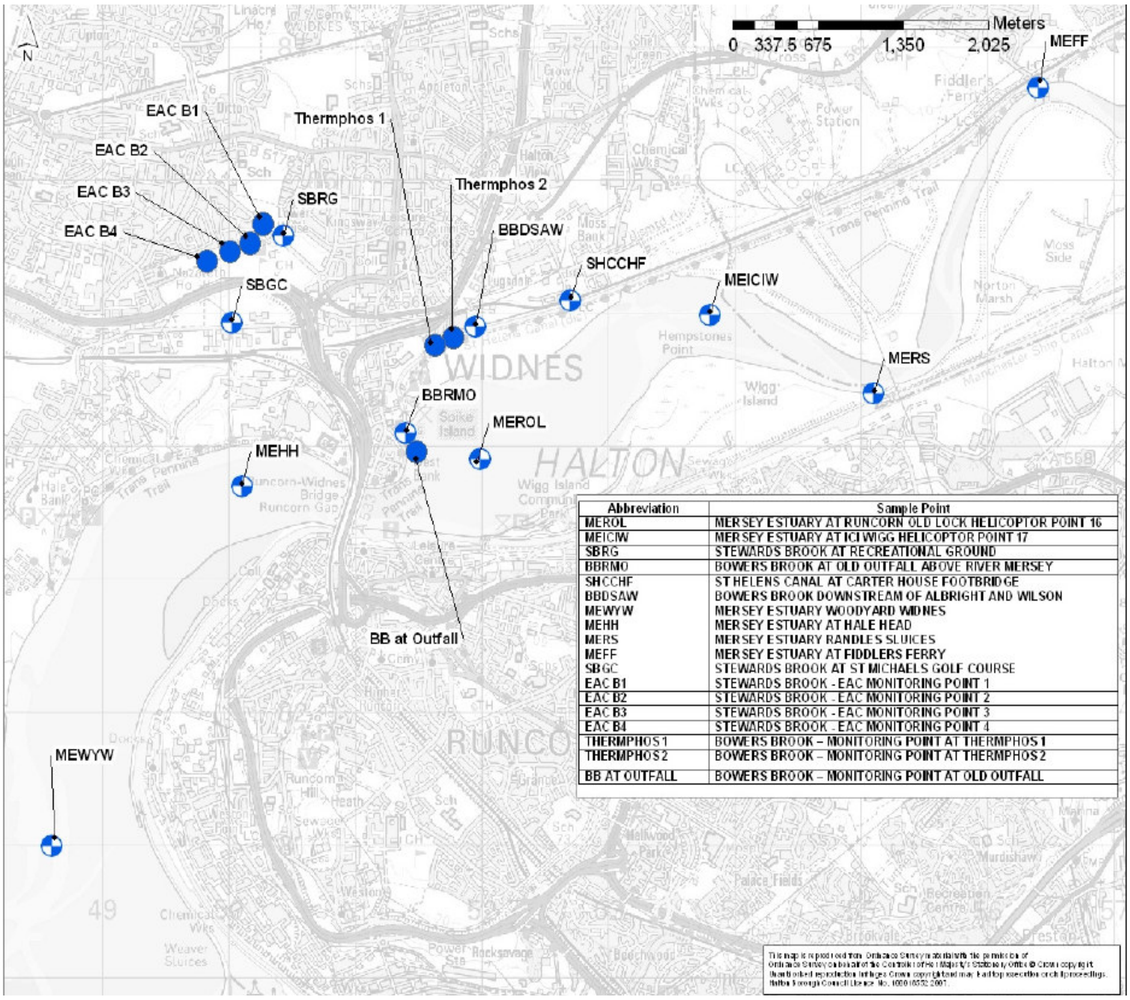
1 *Pers. Comms, EA, 2008*

a. ‘QSL at Liverpool road to Golf Club’ (Recreation Ground) – located at OSNGR 350700E 386200N; and

b. ‘Golf Club to Fwl’ (former St. Michaels Golf Course) – located at OSNGR 350450E 349800E 384400N.

8.5.72 The location of these monitoring points, alongside those for other watercourses, is shown on Figure 8.3. The monitoring points at the Recreation Ground and former St. Michaels Golf Course are 900m upstream and 1km downstream of the main toll plaza of the Project respectively.

Figure 8.3 - Monitoring Locations



8.5.73 The chemical status of the water quality for Stewards Brook at the ‘Recreation Ground’ and ‘Former St. Michaels Golf Course’ monitoring points is shown in Table 8.8. This data has been obtained from the EA website (Ref. 16).

Table 8.8 - Water Quality Chemical Status at Stewards Brook

Sampling Data Set	Year	Dissolved Oxygen (% saturation) 10-percentile		Biochemical Oxygen Demand (mg/l) 90-percentile		Ammonia (mgN/l) 90-percentile	
		Value	GQA Grade	Value	GQA Grade	Value	GQA Grade
Stewards Brook at Recreation Ground	2001-2003	60.71	**C**	5.18	**C**	0.652	**C**
	2004-2006	66.1	**C**	2.81	**B**	0.196	**A**
Stewards Brook at the former St. Michaels Golf Course	2001-2003	14.18	**F**	8.80	**E**	1.792	**D**
	2004-2006	7.55	**F**	8.74	**E**	2.645	**E**

8.5.74 In addition to the GQA data obtained from the EA website, chemical test data for the samples from the two monitoring positions on Stewards Brook was also obtained from the EA to supplement the EA website data. Chemical test data was available for dissolved oxygen, BOD, ammonia, pH and suspended solids (it should be noted that no dissolved oxygen or suspended solids data was available for the monitoring point called 'Stewards Brook at the former St. Michaels Golf Course'. The available data for each determinand has been averaged and is shown graphically in Figures 8.4 to 8.6. Data for this watercourse is available since 1992 as this was the year that the EA first started monitoring the water quality in the watercourse.

Figure 8.4 - Water Quality Data Summary at Stewards Brook, from Samples Taken at the 'Recreation Ground' Monitoring Point

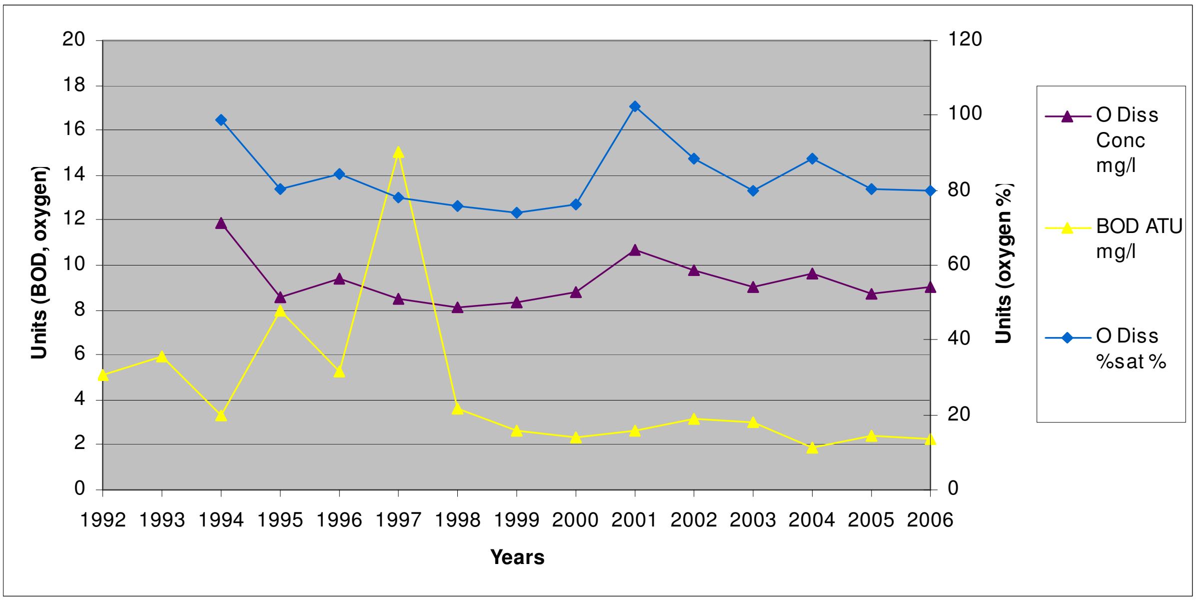


Figure 8.5 - Water Quality Data Summary at Stewards Brook, from Samples Taken at the 'Recreation Ground' Monitoring Point

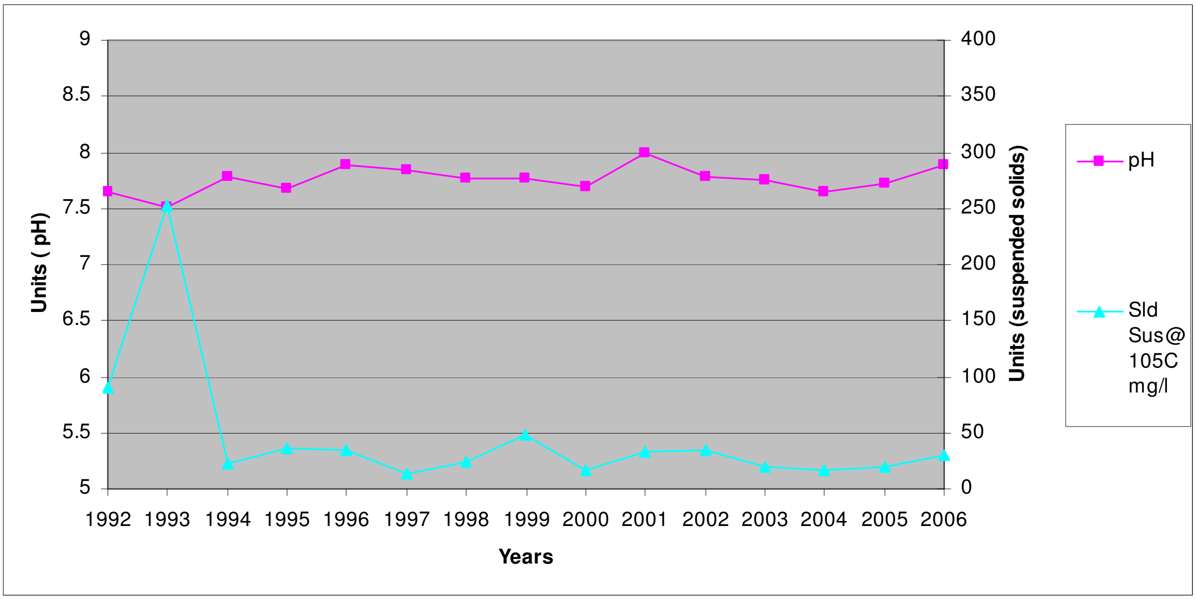
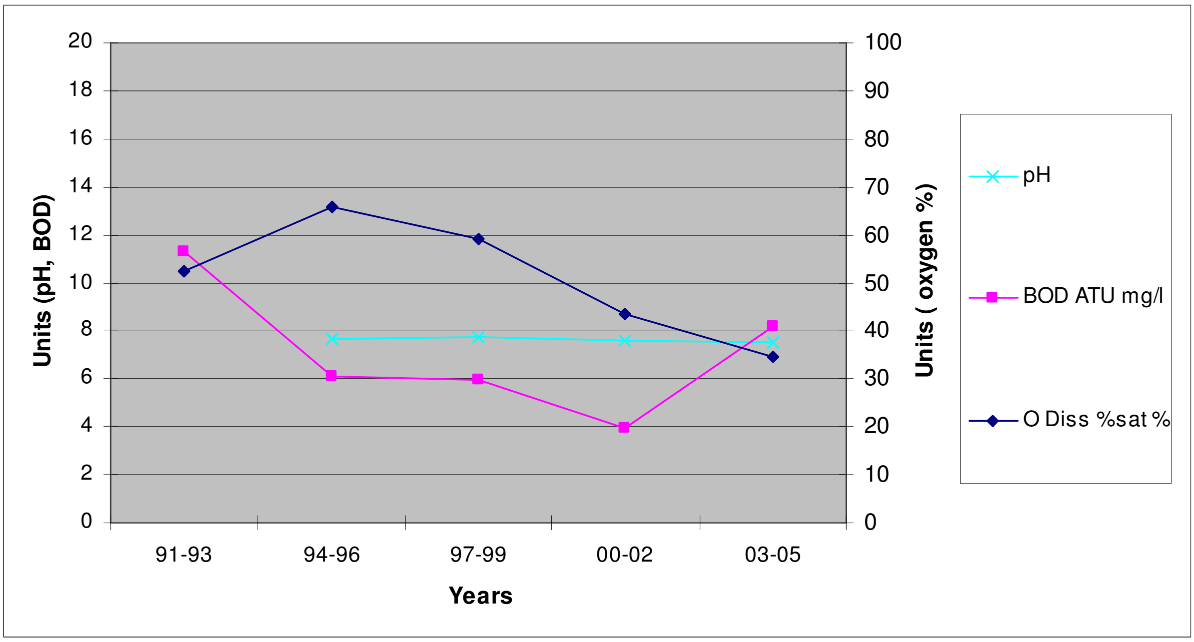


Figure 8.6 - Water Quality Data Summary at Stewards Brook, from Samples Taken at the 'Former St. Michaels Golf Course' Monitoring Point



The Council's Data

8.5.75 The Environmental Advice Centre (EAC) undertook a study on behalf of the Council in 2003 to determine the extent of contamination at the former St. Michaels Golf Course (Ref. 18). This included sampling of Stewards Brook. The EAC study only looked at the northern part of the former St. Michaels Golf Course, north of the A562 Speke Road.

8.5.76 EAC undertook six rounds of surface water monitoring from Stewards Brook over one year at four points along the brook. Determinands tested included:

a. pH;
b. COD'
c. BOD;
d. Suspended Solids;
e. Chloride;
f. Sulphate;
g. Sulphide;
h. Ammoniacal Nitrogen;
i. Nitrate;
j. Nitrite;
k. Cyanide;
l. Chromium;
m. Iron;
n. Lead;
o. Nickel;
p. Cadmium;
q. Zinc;
r. Mercury;
s. Arsenic;
t. Aluminum;
u. Barium;
v. Calcium; and
w. Coliforms

8.5.77 The sampling locations (shown on Figure 8.3) were all located outside of the study area for the Project, but nevertheless provide useful information as they are located upstream of the proposed works and within the confines of the golf course. The results were compared against the EA EQS values; arsenic was the only determinand to exceed the relevant EQS value. This is tabled below, with exceedances shown in bold:

Table 8.9 - Surface Water Monitoring Results for Stewards Brook as taken by EAC

Determinand	**Monitoring Location B1 (µg/l)**	**Monitoring Location B2 (µg/l)**	**Monitoring Location B3 (µg/l)**	**Monitoring Location B4 (µg/l)**	**Arsenic EQS Value (µg/l)**
Round 1	6.1	10.2	**153**	**202.8**	50
Round 2	2.3	**60.3**	Not Analysed	**68.6**	50
Round 3	20.5	11.3	38.3	4.7	50
Round 4	**62.6**	8.9	**414.7**	**194.7**	50
Round 5	3.3	4.1	11.7	12.8	50
Round 6	1.9	2.2	13.3	6.8	50

Analysis of Data

8.5.78 Upstream, at the 'Recreation Ground' the most recent monitoring data indicates that Stewards Brook has an overall GQA of 'fairly good'.

8.5.79 Water quality at the 'Former St. Michaels Golf Course' monitoring location is of a considerably lower quality. The most recent monitoring data has water quality with a GQA of 'bad'.

8.5.80 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. Michaels Golf Course. This is discussed in the Contamination of Soils, Sediments and Groundwater Chapter of this ES (Chapter 14).

8.5.81 Sampling of Stewards Brook undertaken by EAC on behalf of the Council has shown exceedances for arsenic when compared to the relevant EQS value. It should be noted that these were taken at locations in the northern part of the former St. Michaels Golf Course, outside and upstream of the study area.

8.5.82 Monitoring results for samples taken at the 'Recreation Ground' sampling location show a trend of improvement in water quality as indicated by decreasing BOD levels. However, there is little variation over time within the other parameters. Water quality results at the 'Former St. Michaels Golf Course' sampling location shows a trend of improvements in quality until the mid 1990s. This is reversed thereafter when a trend of decreasing water quality is charted by decreasing dissolved oxygen levels and increasing BOD values.

Bowers Brook

Description of Watercourse

8.5.83 The source of Bowers Brook is shown on OS mapping at NGR 351842E 388636N at a point to the east of Cranshaw Hall, in the northern part of Widnes. This location is approximately 5km to the north of the Upper Mersey. The source is shown on the map as an 'issue'.

8.5.84 The OS map shows Bowers Brook flowing to the south east and south through Widnes, which is shown in culvert until it reaches the St Helens Canal at OSNGR 352000E 384855N. At this point Bowers Brook passes beneath St Helens Canal in culvert before flowing into a land drain on Widnes Warth saltmarsh, which flows into the Upper Mersey at OSNGR 352024E 384522N.

8.5.85 A spur of Bowers Brook is located to the north of the St Helens Canal and is orientated north east to south west. The spur joins the main part of Bowers Brook in culvert to the north of the point where Bowers Brook passes beneath the St. Helens Canal. The spur is between 10m and 30m from the St Helens Canal and is in culvert for the majority of its length before discharging into the Upper Mersey at Spike Island, Widnes (NGR 351409E 384064N). This is marked as 'Bowers Pool' on the OS map.

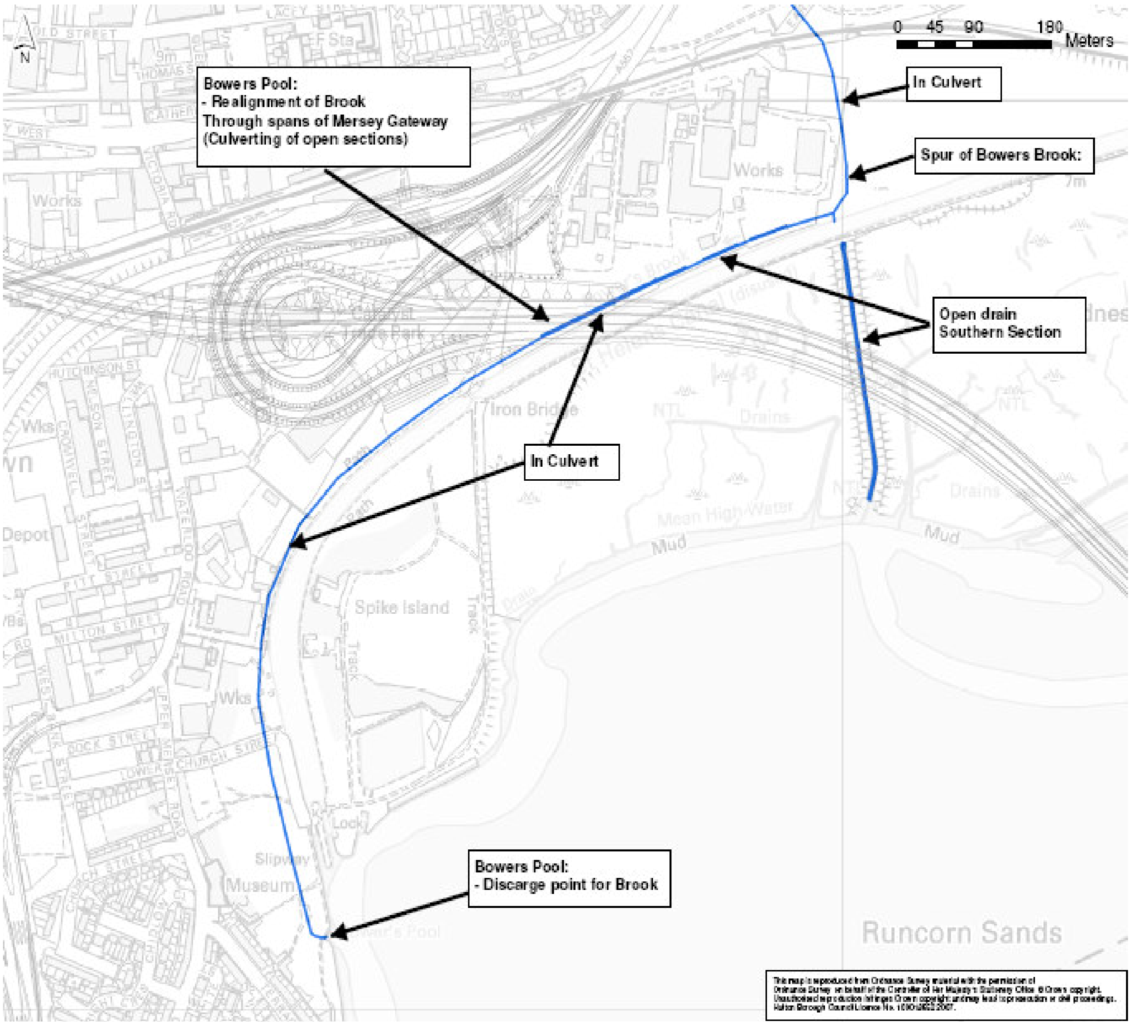
8.5.86 The length of the spur is approximately 1.1km and comprises of a brick lined culvert for much of its length. Some parts have been replaced with concrete pipe in the last twenty years.

8.5.87 The Project crosses Bowers Brook between OSNGR 351628E 384731N and 351730E 384781N, a distance of approximately 120m. The OS map and aerial photographs show that most of this length (100m) is currently an open ditch where Bowers Brook is not in culvert. The spur has been observed by Gifford and APEM in January 2007 to have both tidal and fluvial flows.

8.5.88 Investigations undertaken as part of the Contamination of Soils, Sediments and Groundwater Chapter (Chapter 14) of this ES has stated that there are existing services and drainage pipes beneath the plot of land known as Catalyst Trade Park which is located at the site of the new Widnes Loops junction. These drains outfall to three discharge points in Bowers Brook. As part of the Project the relatively modern light industrial units within the Catalyst Trade Park site will be dismantled and recycled with the concrete foundations removed. Existing services and drainage at the Catalyst Trade Park site including the three discharge points will be stopped off to prevent any remaining waters present in the system from entering the brook. There will be no requirement to maintain the drainage network beneath the Catalyst Trade Park and it will either be grubbed up or isolated to ensure that the drains are not functional as the drainage network beneath the Catalyst Trade Park will become redundant.

8.5.89 The CMR (Appendix 2.1, Chapter 2) states that the open sections of Bowers Brook where the New Bridge crosses the brook will be culverted. The alignment of Bowers Brook is shown on Figure 8.7 below.

Figure 8.7 - Bowers Brook



Abstractions and Discharges

8.5.1 There are no current registered abstraction licenses for Bowers Brook.

8.5.2 Current registered discharges into Bowers Brook which are covered under discharge consent issued by the EA are listed in Table 8.10.

Table 8.10 - Discharge Consents for Bowers Brook

Operator	Distance and Bearing From Site	Discharge Type
United Utilities Water Plc	766m East	Public Sewage: Storm Sewage Overflow
United Utilities Water Plc	766m East	Public Sewage: Storm Sewage Overflow
Rhodia Consumer Specialities Ltd	885m East	Trade Discharge – Process Water
Rhodia Consumer Specialities Ltd	885m East	Sewage Discharges – Final/Treated Effluent – Not Water Company
Aldi Stores Ltd	963m North East	Sewage Discharges – Final/Treated Effluent – Not Water Company

Chemical Surface Water Quality

EA Data

8.5.3 There is one current EA water quality monitoring point apparent from the EA website that is located along Bowers Brook. This is 'QSL at Derby Road to FWL' located at OSNGR 352200E 387800N. This is shown on Figure 8.3. This monitoring point is located 300m to the north of the Project, upstream of the Project.

8.5.4 The chemical status of the water quality for Bowers Brook at the 'QSL at Derby Road to FWL' monitoring point is shown in Table 8.11.

Table 8.11 - Water Quality Chemical Status at Bowers Brook

Sampling Data Set	Year	Dissolved Oxygen (% saturation) 10-percentile		Biochemical Oxygen Demand (mg/l) 90-percentile		Ammonia (mgN/l) 90-percentile	
		Value	GQA Grade	Value	GQA Grade	Value	GQA Grade
QSL at Derby Road to FWL	2001-2003	81.38	**A**	3.49	**B**	0.460	**B**
	2004-2006	81.38	**A**	3.49	**B**	0.460	**B**

8.5.5 In addition to the data obtained from the EA website chemical test data has been obtained from the EA. These have been obtained for two monitoring locations along Bowers Brook which the EA do not monitor any longer and are not shown on the EA website. These are for the monitoring stations known as 'Bowers Brook at Downstream of Albright and Wilson' and 'Bowers Brook at the Old Outfall above the Mersey Estuary'. The locations are shown on Figure 8.3. Both these sampling locations are shown on Figure 8.3. The data for both these sample locations is incomplete and of limited temporal extent. Data for Bowers Brook 'Downstream of Albright and Wilson' is available for the period 1978 – 1995 (although data for the interim period 1987 – 1993 is not available) and data for the 'Old Outfall above the Mersey Estuary' available between 1976 and 1996. The data received from the EA for these two monitoring stations has been shown graphically in Figures 8.8 to 8.11.

Figure 8.8 - Bowers Brook Downstream of Albright and Wilson Water Quality Data Summary (1978 – 1995)

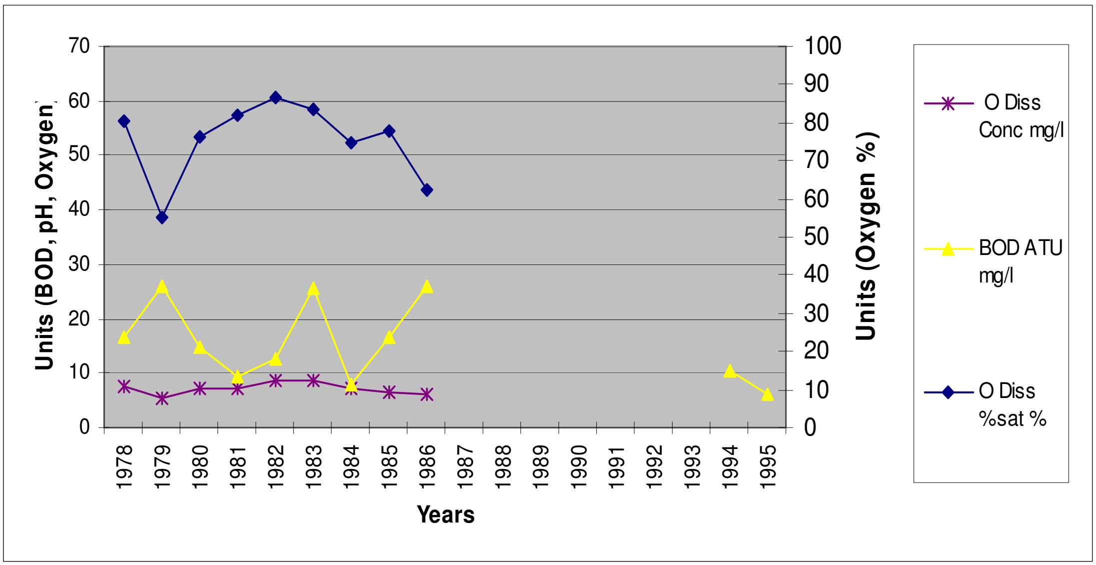


Figure 8.9 - Bowers Brook Downstream of Albright and Wilson Water Quality Data Summary (1978 – 1995)

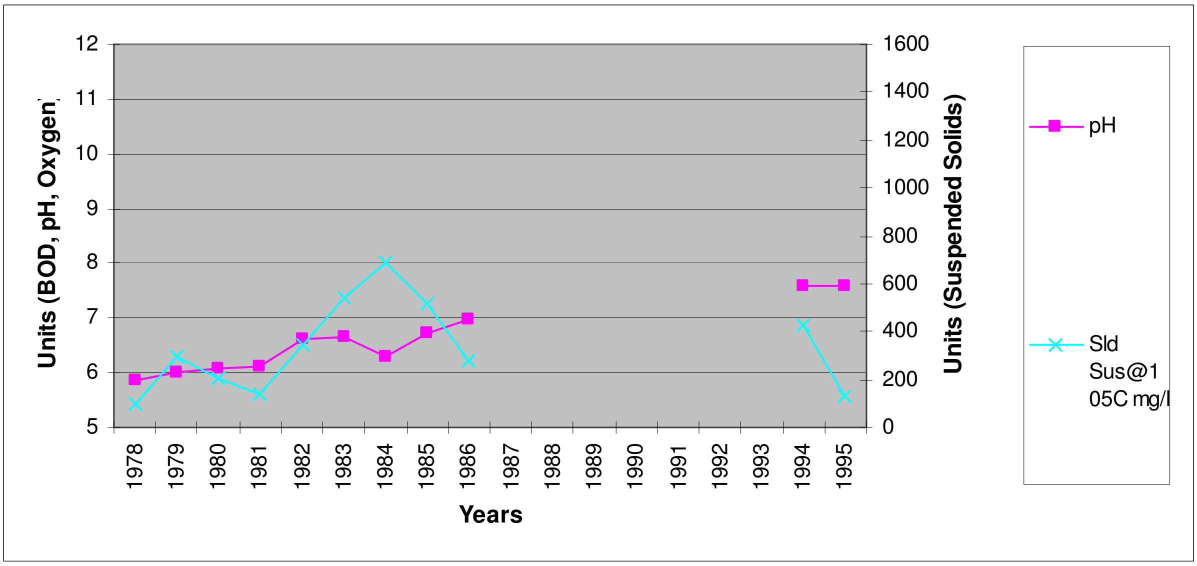


Figure 8.10 - Bowers Brook Outfall above Mersey Estuary Water Quality Data Summary (1976 – 1996)

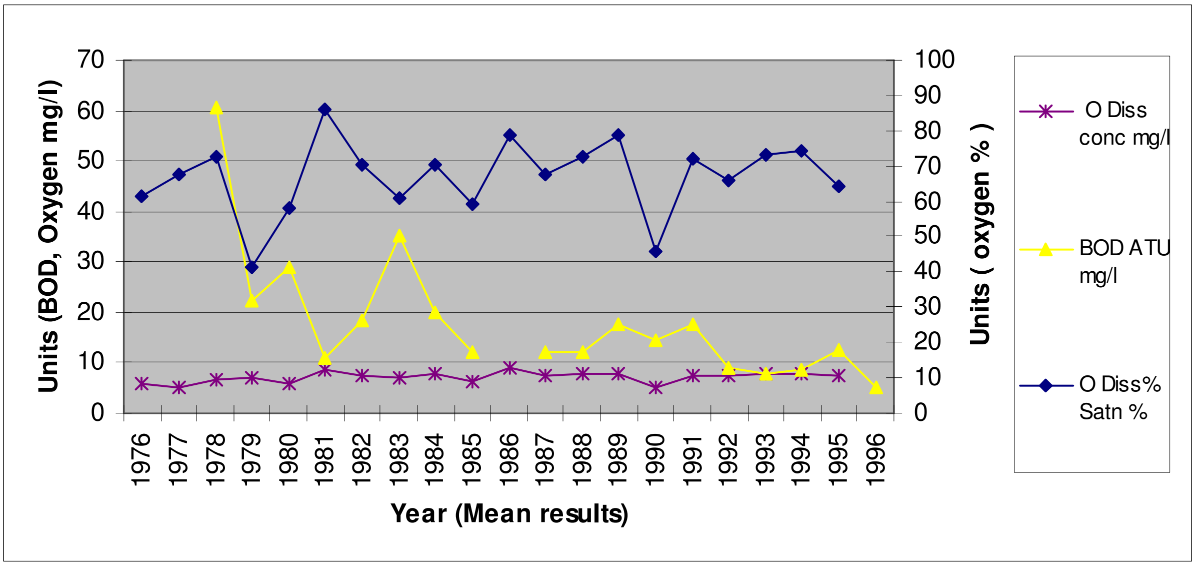
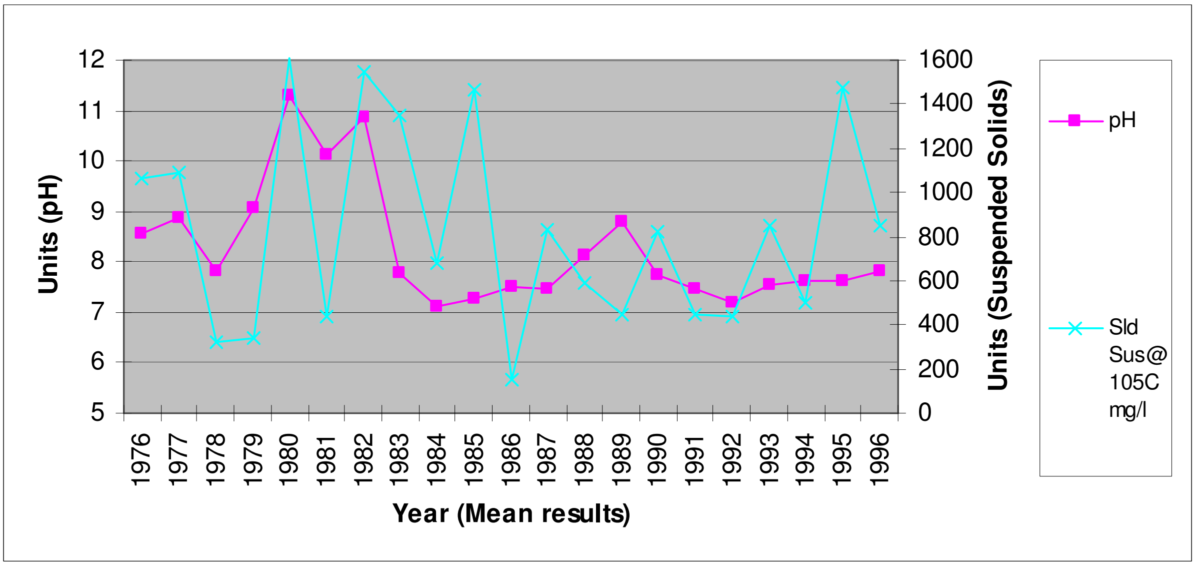


Figure 8.11 - Bowers Brook Outfall above Mersey Water Quality Data Summary (1976 – 1996)



Gifford Data

8.5.6 Results of the water samples undertaken by Gifford in 2007 have been compared against the relevant estuarine and freshwater List 1 and List 2 EQS values. Both freshwater and saline EQS values have been used as the brook has tidal as well as fluvial flow. Comparison of the results with EQS's is shown in Table 8.12 and 8.13, with exceedances shown in bold.

Table 8.12 - Results for List 1 EQS Substances

Determinand	Bowers Brook at Thermphos 1 (µg/l)	Bowers Brook at Thermphos 2 (µg/l)	Bowers Brook at Outfall (µg/l)	Fresh water EQS (µg/l)	Salt water EQS (µg/l)
Cadmium	<10	10	<10	5	2.5
Carbon Tetrachloride	<1	**55**	1	12	12
Chloroform	<1	**78**	2	12	12
1,1,2 – Trichloroethylene	<1	2	**69**	10	10

Table 8.13 - Results for List 2 EQS Substances

Determinand	Bowers Brook at Thermphos 1 (µg/l)	Bowers Brook at Thermphos 2 (µg/l)	Bowers Brook at Outfall (µg/l)	Fresh Water EQS (µg/l)	Salt Water EQS (µg/l)
Arsenic	**200**	**160**	**140**	50	25
Copper	**60**	**340**	**90**	28	5
Iron	**2.3**	0.72	0.28	1	1
Lead	**40**	**30**	**30**	250	25
Zinc	**290**	**850**	**370**	8	No EQS
Nickel	**30**	**80**	20	50	30

Analysis of Data

8.5.7 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.

8.5.8 The Figures 8.8 to 8.11 show that historically the water quality at the 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 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. It is not clear why there are such differences in the values for suspended solids over the years, where one time the amount of suspended solids can be as high as 1600mg/l and the next down to 420mg/l. Whilst the volume of suspended solids in an Estuary is expected to be variable as a result of the dynamic nature of an estuarine environment it is not known why there is such as fluctuation from one year to the next in the brook but is not likely to be an important consideration of this part of the Project.

8.5.9 The high variability that has occurred prior to 1995 for all the parameters at the 'Old Outfall' is due to the tidal influence at the outfall of the Brook. At high tide the sample point becomes inundated by the estuarine waters of the Estuary as opposed to only the fluvial outflow that is present at lower tides. The majority of sampling at this point occurred at low tides, and therefore, the results are expected to be more representative of water within Bowers Brook rather than mixed waters from the Estuary.

8.5.10 The monitoring results obtained for the Project provide an indication of the chemical status of the water at the location of the sample. Ammonia values were 1.2mg/l and 44mg/l at the Thermphos sample locations, these correspond approximately with 'fairly good' and 'bad' water quality on the EA GQA grading system. At the outfall the ammonia concentration was 35mg/l again approximately equivalent to 'bad' water quality. Using the 2:1 conversion of Chemical Oxygen Demand (COD) to BOD water quality would roughly correspond to 'fair' to 'poor' categories at the three sample locations.

8.5.11 COD values, which can be used to approximate BOD values using a 2:1 ratio suggest no significant change has occurred to the water quality within Bowers Brook. COD values within the section of brook passing through the Thermphos site were 14 and 22mg/l and at the outfall 15mg/l.

8.5.12 A number of exceedances of the relevant EQS values were noted from the monitoring undertaken for the Project. Most significant are the exceedances of the List1 EQS substances; Carbon Tetrachloride, Chloroform and 1,1,2 – Trichloroethylene. Carbon Tetrachloride and Chloroform was noted as exceeding the EQS threshold value of 12µg/l at the sampling location where the New Bridge will cross Bowers Brook. 1,1,2 – Trichloroethylene was recorded at the outfall at into the Estuary at Bowers Pool with at a concentration of approximately seven times the EQS value.

8.5.13 These substances have been noted in the shallow groundwater and within soils at the Catalyst Trade Park site to the north of Bowers Brook. This is documented in Chapter 14 (Contamination of Soils, Sediments and Groundwater). These substances are chlorinated solvents, which are likely to be present as Dense Non Aqueous Phase Liquid (DNAPL) (a liquid that is denser than water and only slightly soluble in water), are able to migrate through the soil and it is likely that these substances are migrating southwards from the Catalyst Trade Park site into Bowers Brook. These could then wash into the Upper Mersey through tidal and fluvial flows and diluted in the Upper Mersey.

8.5.14 The same monitoring results show that there are a number of exceedances of List 2 substances, comprising heavy metals.

St Helens Canal

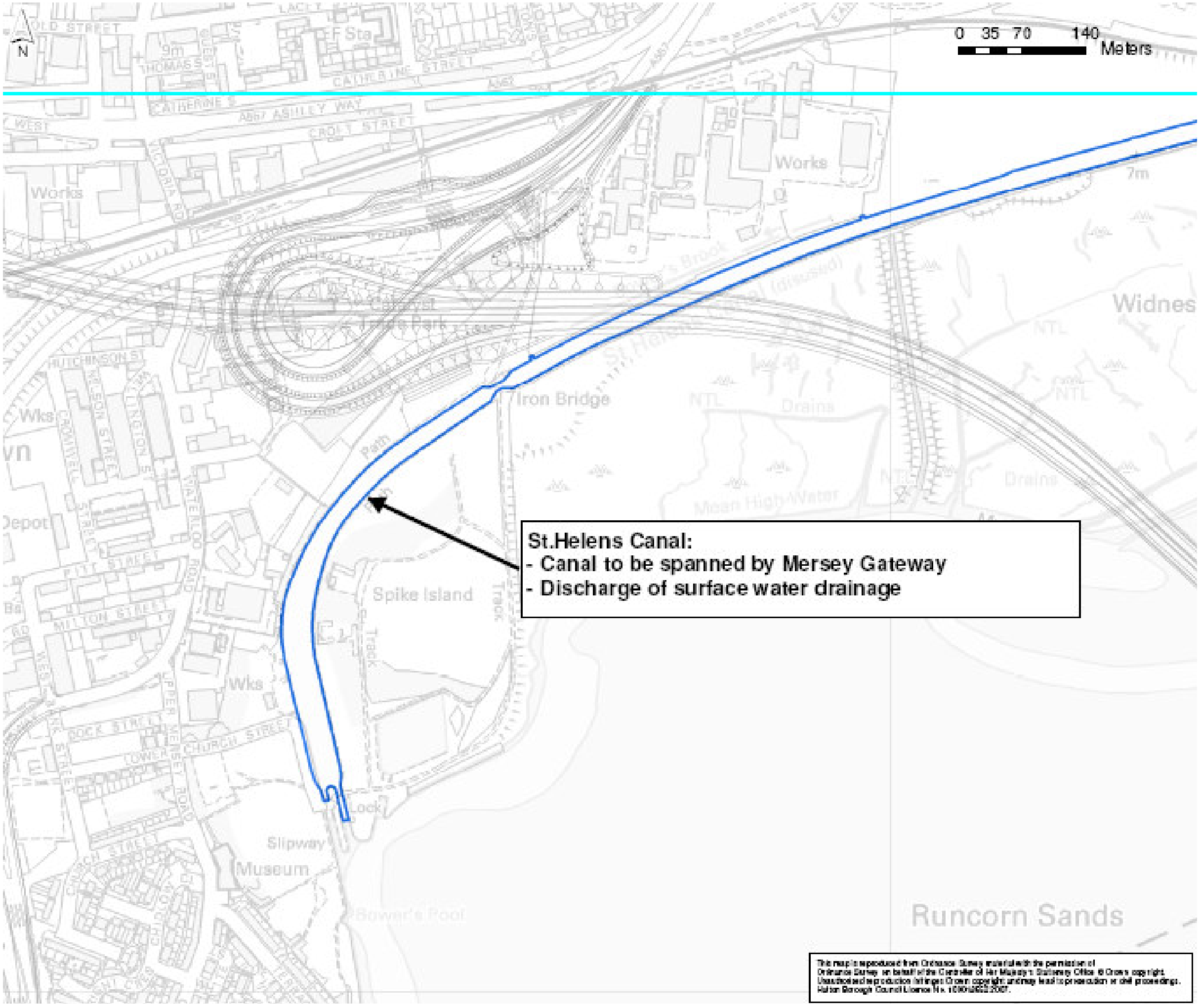
Description of Watercourse

8.5.15 The St Helens Canal is a canal linking St Helens in Lancashire to the Upper Mersey at Spike, Island, Widnes, a distance of approximately 25km. The New Bridge crosses the canal between OSNGR 351787E 384779N and OSNGR 351682E 384733N. At this point the St Helens Canal is 14m wide and is orientated south west to north east.

8.5.16 The CMR (Appendix 2.1, Chapter 2) states that the new carriageway would be taken over the St. Helens Canal on a new reinforced concrete structure integral with the north abutment of the

New Bridge. It is also proposed to temporarily infill the canal (whilst maintaining its drainage water transfer function through the provision of a large diameter bypass pipe) to provide access for construction plant over the canal. On completion it is proposed that the canal would be reinstated with some minor changes to the alignment comprising the narrowing of the canal width from 14m to 10m. The alignment of the St Helens Canal is shown on Figure 8.12.

Figure 8.12 - St. Helens Canal



8.5.17 It is proposed to discharge surface water runoff from the Project into the St Helens Canal.

Abstractions and Discharges

8.5.18 There are no registered abstractions or discharge consents for the St Helens Canal.

8.5.19 It is proposed to discharge surface water drainage from the Project to a swale (i.e. a shallow sided ditch – see the FRA in Appendix 8.2 for further details) located to the north of the St Helens Canal. The drainage design for the Project will incorporate proposals to ensure that highway run-off is treated prior to entering surface watercourses. This is discussed in the in the FRA in Appendix 8.2.

Chemical Surface Water Quality

EA Data

8.5.20 There is one EA water quality monitoring point located within the St Helens Canal. This is 'Fiddlers Ferry to Mersey Estuary' (Carter House Footbridge) located between OSNGR 356000E 386400N and 351400E 384200N. This monitoring point covers the stretch of the canal which the Project will cross.

8.5.21 The chemical status of the water quality for the St Helens Canal at Carter House Footbridge is shown in Table 8.14.

Table 8.14 - Water Quality Chemical Status at the St Helens Canal

Sampling Data Set	Year	Dissolved Oxygen (% saturation) 10-percentile		Biochemical Oxygen Demand (mg/l) 90-percentile		Ammonia (mgN/l) 90-percentile	
		Value	GQA Grade	Value	GQA Grade	Value	GQA Grade
St Helens Canal at Carter House Footbridge	2001-2003	53.54	**D**	7.62	**D**	0.115	**A**
	2004-2006	56.19	**D**	6.20	**D**	0.113	**A**

8.5.22 In addition to the chemical GQA information obtained from the EA website chemical test data was also obtained from the EA. This comprised data for dissolved oxygen, BOD, saturated oxygen, pH and suspended solids for the period 1992 to 1996. This is shown graphically in Figures 8.13 and 8.14. It should be noted that the information for dissolved oxygen and saturated oxygen was not available from the EA for the period 1996-2001.

Figure 8.13 - St Helens Canal at Carterhouse Footbridge Water Quality Data Summary (1992 – 2006)

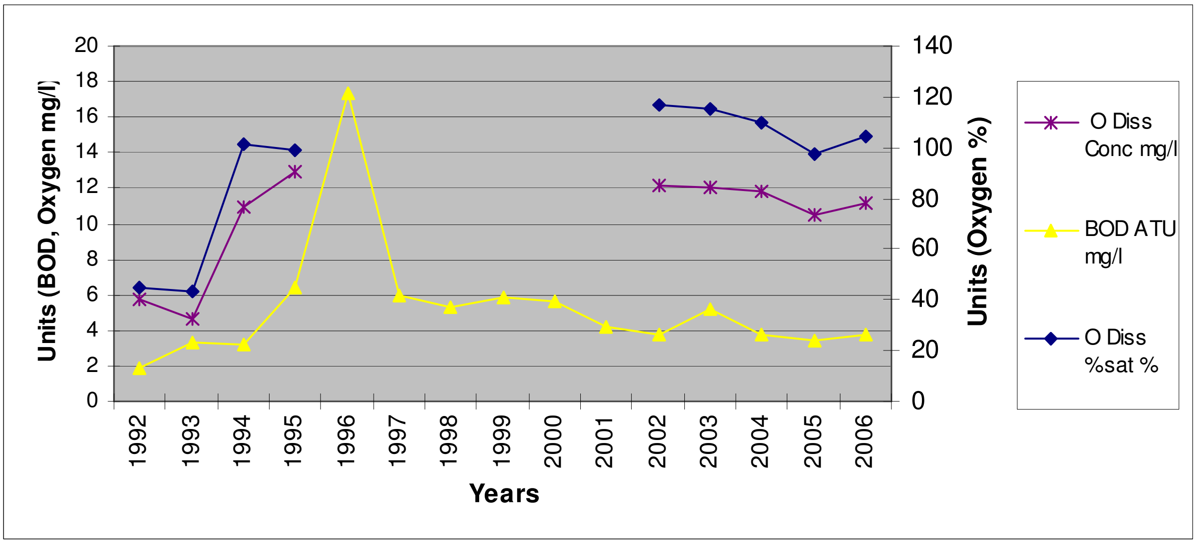
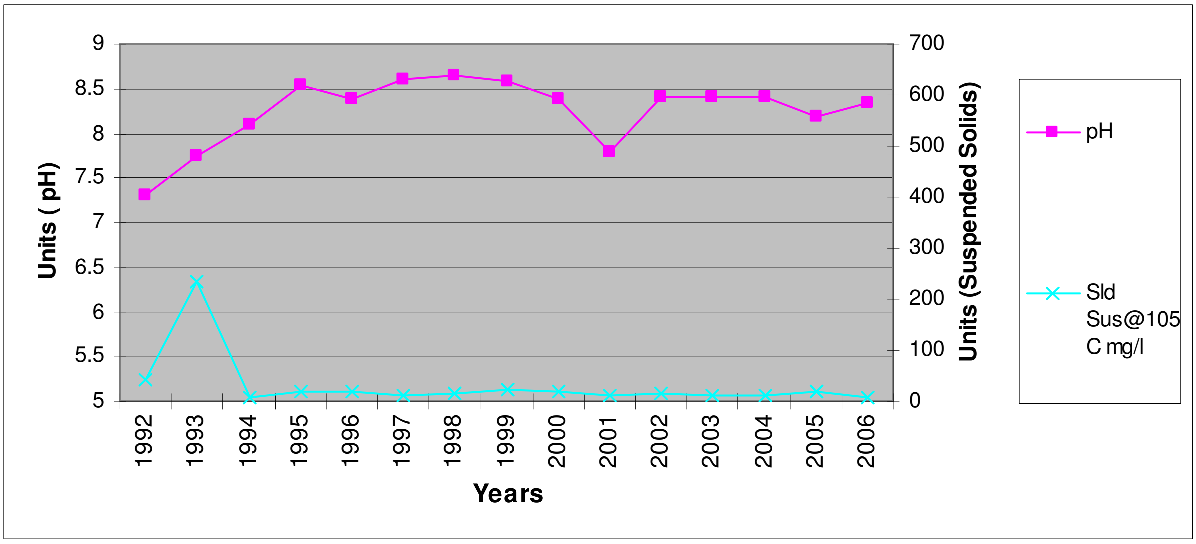


Figure 8.14 - St Helens Canal at Carterhouse Footbridge Water Quality Data Summary (1992 – 2006)



Analysis of Data

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

8.5.24 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.

8.5.25 Heavy metal concentrations taken from the St Helens Canal water quality monitoring station have been reviewed in line with the EA EQS. The contaminant suite for the monitoring station is limited, and therefore elevated concentrations of other contaminants could be present within the surface water, which are not reported here. Of the sample results shown in Appendix 8.3 the only exceedance over the EA EQS for freshwaters was for a single result for copper taken in 1996. The result for copper (28.5 µg/l) exceeded the EQS value of 28µg/l for waters with a hardness of 28.5 mg/l CaCO3.

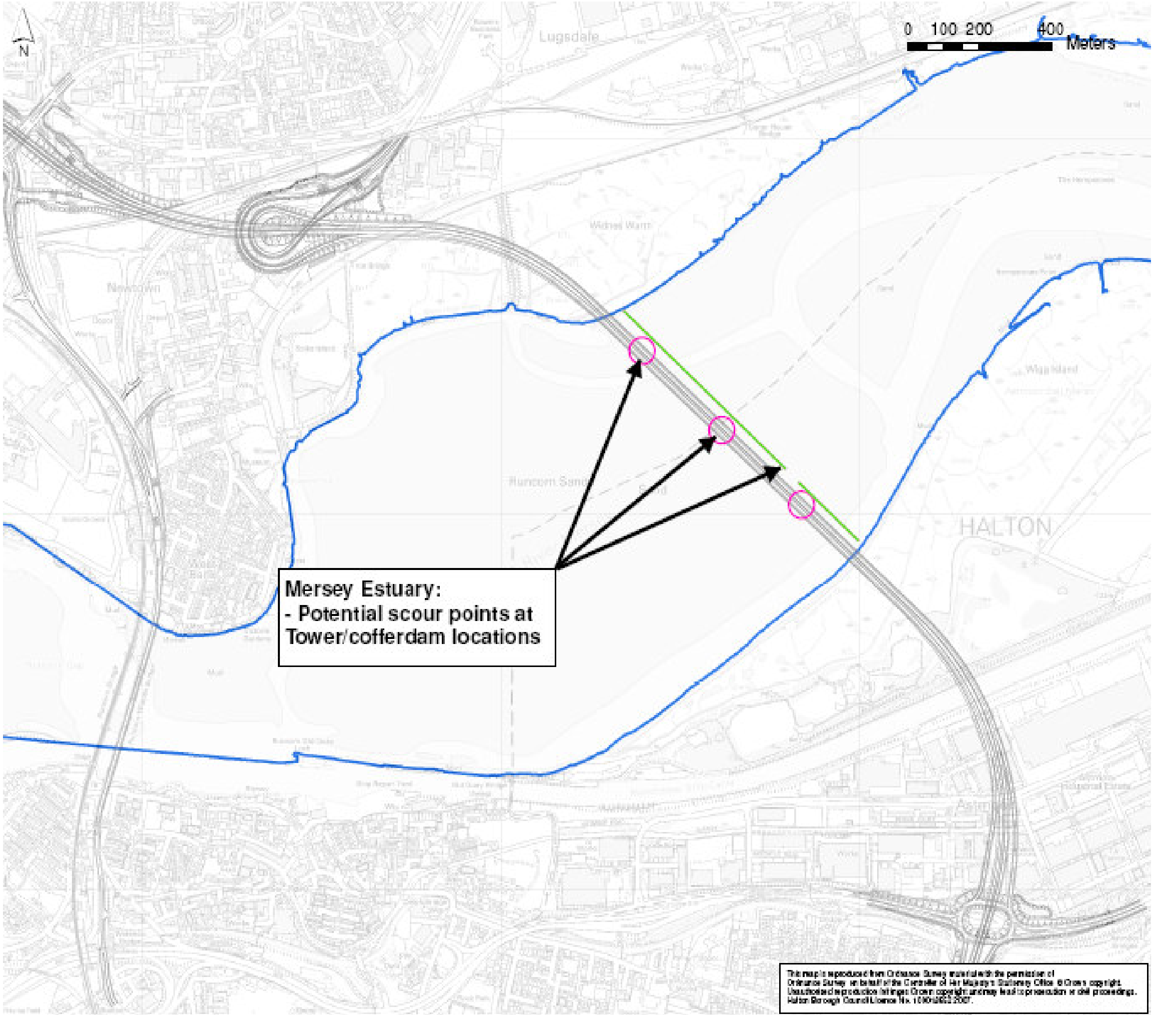
The Estuary

Watercourse Description

8.5.26 The New Bridge is located within the 'Upper Mersey Estuary' which extends from the tidal limit at Howley Weir to Hale Head. It is situated between Runcorn Gap (with the SJB) in the west and Fiddler's Ferry in the east. The town of Runcorn is located to the south of the area, whilst Widnes lies to the north. Saltmarshes are located immediately north and south of the river.

8.5.27 It is proposed to construct three cofferdams and a piled jetty within the Estuary to allow access to the working area, from which three towers will be constructed. The cofferdams and piled jetty will be removed upon completion of the towers. These are discussed in detail in the CMR (Appendix 2.1, Chapter 2) and are shown on Figure 8.15.

Figure 8.15 - Upper Mersey Estuary



8.5.28 It is reported in Chapter 7 that the piled jetty will not result in any significant scour given the relatively small diameter of these piles and the short term duration for which they will be required. This was shown during the site investigation of the Estuary whereby a jack-up barge was used to retrieve sediment samples. A jack up barge is used for the drilling of boreholes in marine and fluvial environments. The jack up is a floating vessel which uses legs to position itself over a location and can elevate its deck by using the legs to ensure that a safe working platform is provided over the water level. The legs of the rig were of similar diameter to the piles that would be used for the temporary jetty. The scour holes created around the legs of the rig were small and shallow, approximately 0.5m deep. Plate 8.1 shows a photograph of the jack up barge with small scour holes at the base of the legs.

8.5.29 The hydrodynamic and morphological characteristics of these areas are discussed in Chapter 7 of this ES.

Plate 8.1 - Jack Up Barge in the Upper Mersey in 2006 Showing Small Scour Holes

8.5.30 It is not proposed to discharge road water run-off from the Project directly into the Estuary during construction or operation of the Project. Road run-off will be piped via the drainage network and discharged to attenuation features such as balancing ponds before discharging to surface water courses.

8.5.31 The New Bridge will comprise three large towers which will be constructed in the Upper Estuary as shown on Figure 8.15. These will induce scour holes around the base of the towers and thus release bed material initially, followed by smaller amounts of scour erosion and deposition as a result of tidal and fluvial action around the towers. This is described in detail in Chapter 7 (Hydrodynamics and Estuarine Processes). The effects of scour on water quality of the river are discussed in Section 8.7.

Abstractions and Discharges

8.5.32 There are no current registered abstraction licenses for the Upper Estuary.

8.5.33 Current registered discharges into the Upper Estuary which are covered under discharge consent issued by the EA are listed in Table 8.15.

Table 8.15 - Discharge Consents for the River

Operator	Distance and Bearing From Site	Discharge Type
United Utilities Water Plc	751m East	Public Sewage: Storm Sewage Overflow

Operator	Distance and Bearing From Site	Discharge Type
United Utilities Water Plc	751m East	Storm Sewage Overflow Discharge
United Utilities Water Plc	751m East	Settled Storm Discharge – Storm Tank Discharges

8.5.34 Whilst not shown on the discharge consent information, the Council have stated that road runoff from the A533 SJB is currently discharged directly from the deck into the Estuary and no methods are in place to control the quality of the discharge.

Chemical Surface Water Quality

EA Data

8.5.35 There are six EA water quality monitoring points located in the Estuary which have been used to assess the chemical surface water quality. These are:

a. 'Mersey Estuary at Fiddlers Ferry (Fiddlers Ferry) – located at OSNGR 356120E 386450N;
b. 'Mersey Estuary at Randles Sluices' (Randles Sluices) – located at OSNGR 355270E 384410N;
c. 'Mersey Estuary at ICI Wigg Helicopter Point 17' (ICI Wigg) – located at OSNGR 353730E 384950N;
d. 'Mersey Estuary at Runcorn Old Locks Helicopter Point 16' (Runcorn Old Lock) – located at OSNGR 352030E 383860N;
e. 'Mersey Estuary at Woodyard Widnes' (Woodyard Widnes) – located at OSNGR 350070E 383680N; and
f. 'Mersey Estuary at Hale Head' (Hale Head) – located at OSNGR 348670E 381480N.

8.5.36 The location of these monitoring points is shown on Figure 8.3. Table 8.16 shows the results of the two most recent chemical GQAs for the two EA sample points ('Runcorn Old Lock and 'ICI Wigg') located within the study area and have been compared to the corresponding values for the sampling points upstream and downstream of the study area.

Table 8.16 - Water Quality Chemical Status at Mersey Estuary

Sampling Area	Sampling Data Set	Year	Dissolved Oxygen (% saturation) 10-percentile		Biochemical Oxygen Demand (mg/l) 90-Percentile		Ammonia (mgN/l) 90-Percentile	
			Value	GQA Grade	Value	GQA Grade	Value	GQA Grade
Upstream (east) of Study Area	Randles Sluices	2001-2003	55.1	**D**	6.30	**D**	1.15	**D**
		2004-2006	61.8	**C**	No Data	**No Data**	1.46	**D**
	Fiddlers Ferry	2001-2003	52.6	**D**	4.65	**C**	1.57	**D**

Sampling Area	Sampling Data Set	Year	Dissolved Oxygen (% saturation) 10-percentile		Biochemical Oxygen Demand (mg/l) 90-Percentile		Ammonia (mgN/l) 90-Percentile	
			Value	GQA Grade	Value	GQA Grade	Value	GQA Grade
		2004-2006	60.0	**C**	No Data	**No Data**	1.49	**D**
Study Area	Runcorn Old Lock	2001-2003	48.2	**E**	4.3	**C**	1.48	**D**
		2004-2006	64.8	**C**	No Data	**No Data**	0.98	**C**
	ICI Wigg	2001-2003	59.0	**D**	5.05	**C**	0.89	**C**
		2004-2006	60.4	**C**	No Data	**No Data**	1.41	**D**
Downstream (west) of Study Area	Widnes Woodyard	2001-2003	61.6	**C**	2.85	**B**	1.16	**D**
		2004-2006	64.1	**C**	No Data	**No Data**	0.99	**C**
	Hale Head	2001-2003	63.5	**C**	2.85	**B**	1.16	**D**
		2004-2006	69.8	**C**	No Data	**No Data**	0.55	**B**

8.5.37 In addition to the chemical GQA information obtained from the EA website chemical test data was also obtained from the EA. This comprised data for dissolved oxygen, BOD, saturated oxygen, pH and suspended solids for the period 1978 to 2006. This is shown graphically in Figures 8.16 to 8.21. It should be noted that the information for dissolved oxygen and saturated oxygen was not available from the EA for the period 1996-2001.

Figure 8.16 - Runcorn Old Lock Water Quality Data Summary (1978 – 2006)

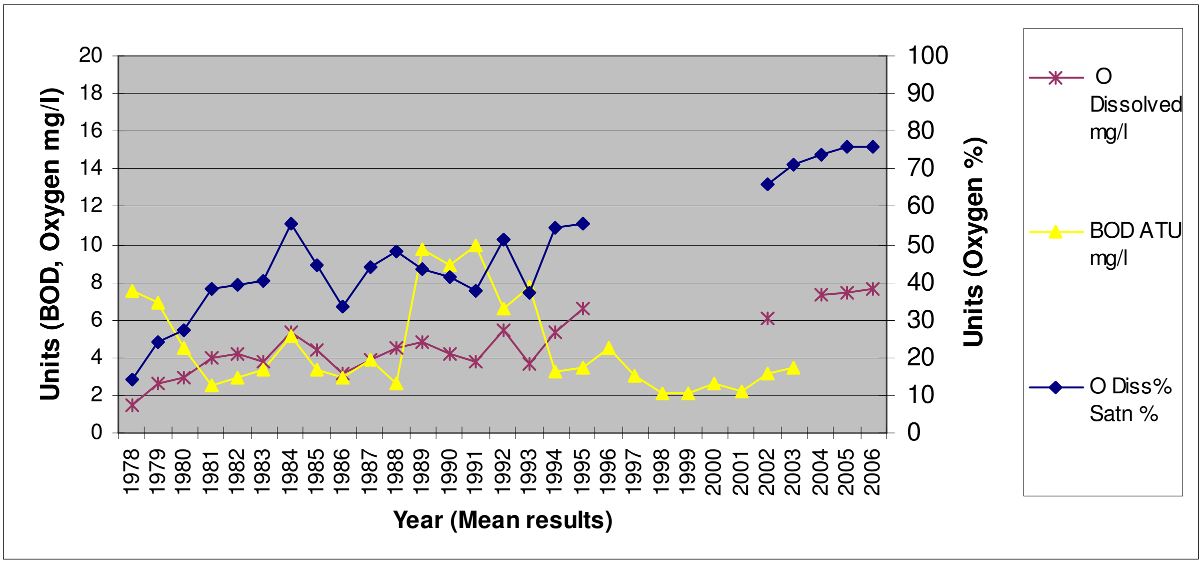


Figure 8.17 - Runcorn Old Lock Water Quality Data Summary (1978 – 2006)

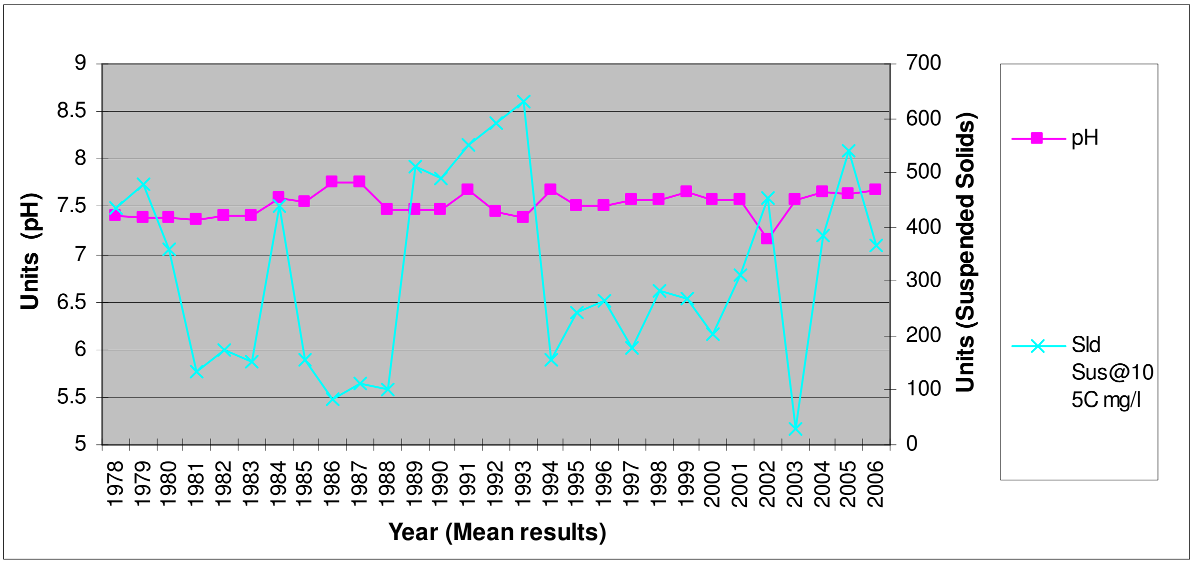


Figure 8.18 - ICI Wigg Water Quality Data Summary (1978 – 2006)

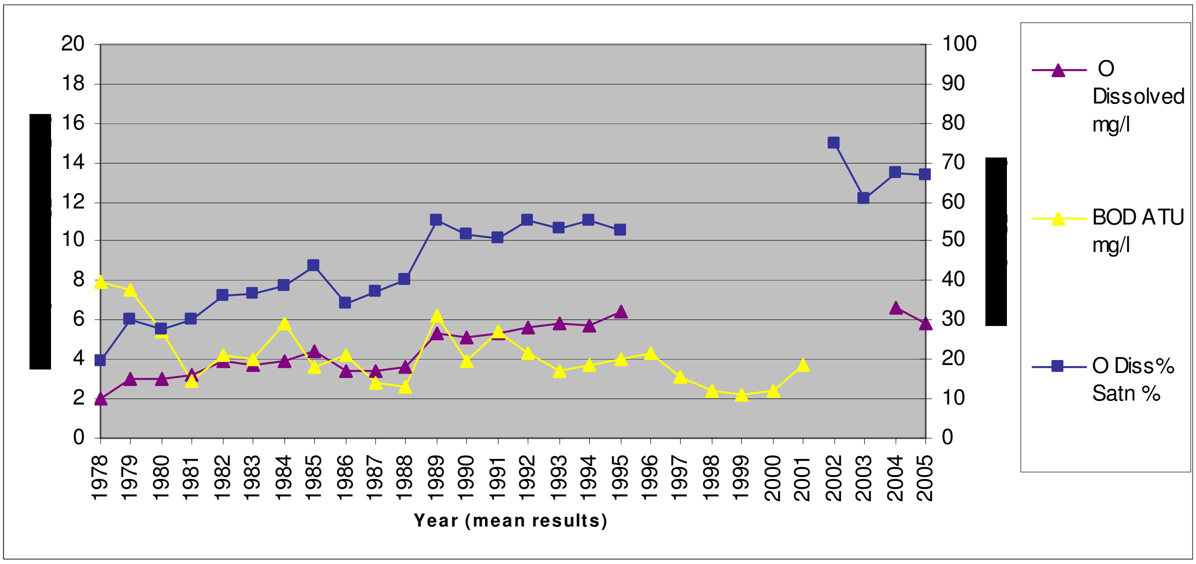


Figure 8.19 - ICI Wigg Water Quality Data Summary (1978 – 2006)

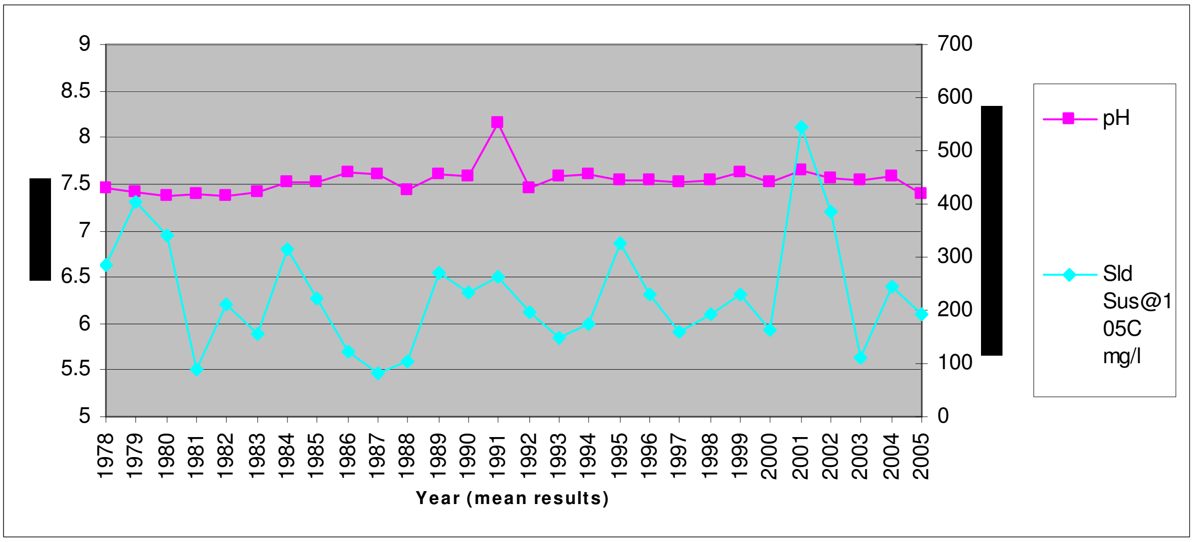


Figure 8.20 - Variability of Suspended Solid Concentrations at Runcorn Old Lock on 26 June 2002

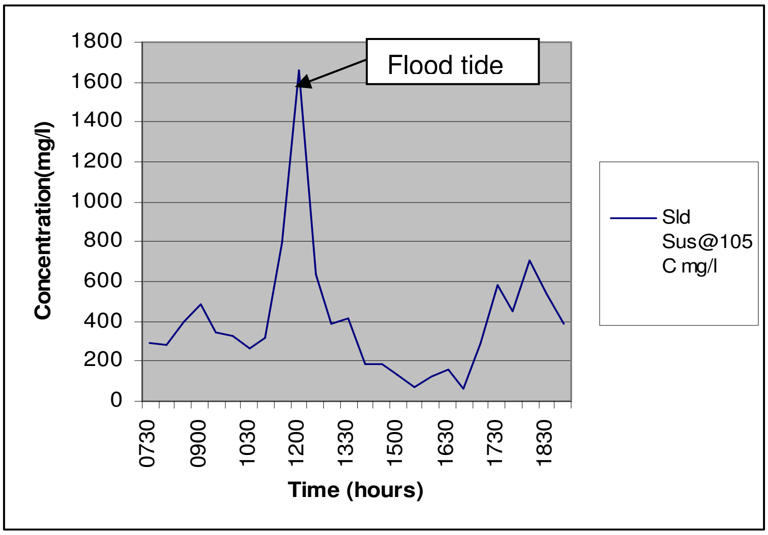
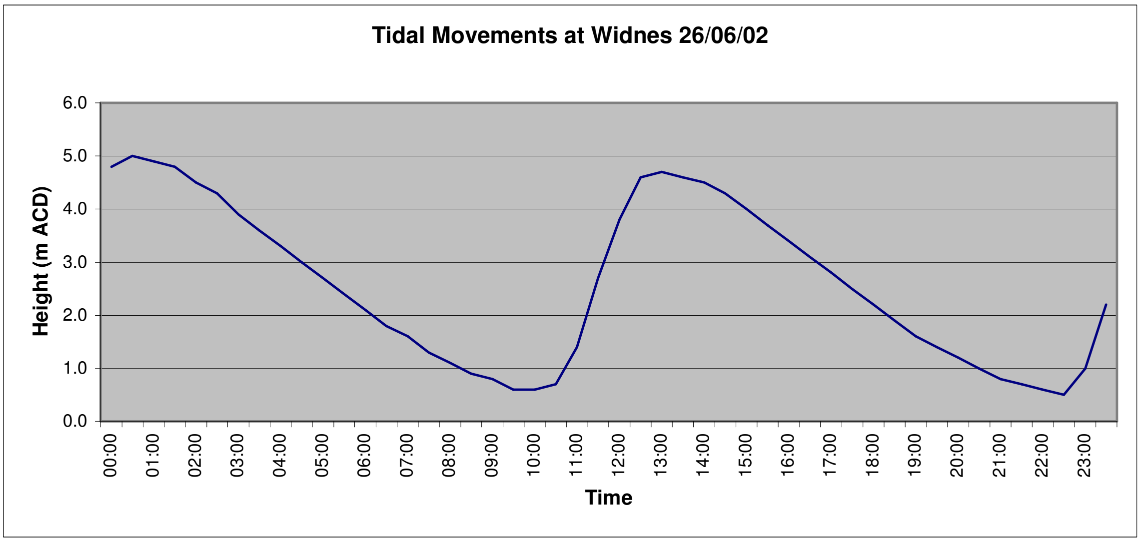


Figure 8.21 - Tidal cycle on 26 June 2002



Analysis of Data

8.5.38 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.

8.5.39 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.

8.5.40 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.

8.5.41 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.

8.5.42 The figures for both monitoring locations show that dissolved oxygen within the samples has increased over time with a decrease in BOD over the same period. This is a good indicator of improving water quality. The values for pH have remained constant at both locations.

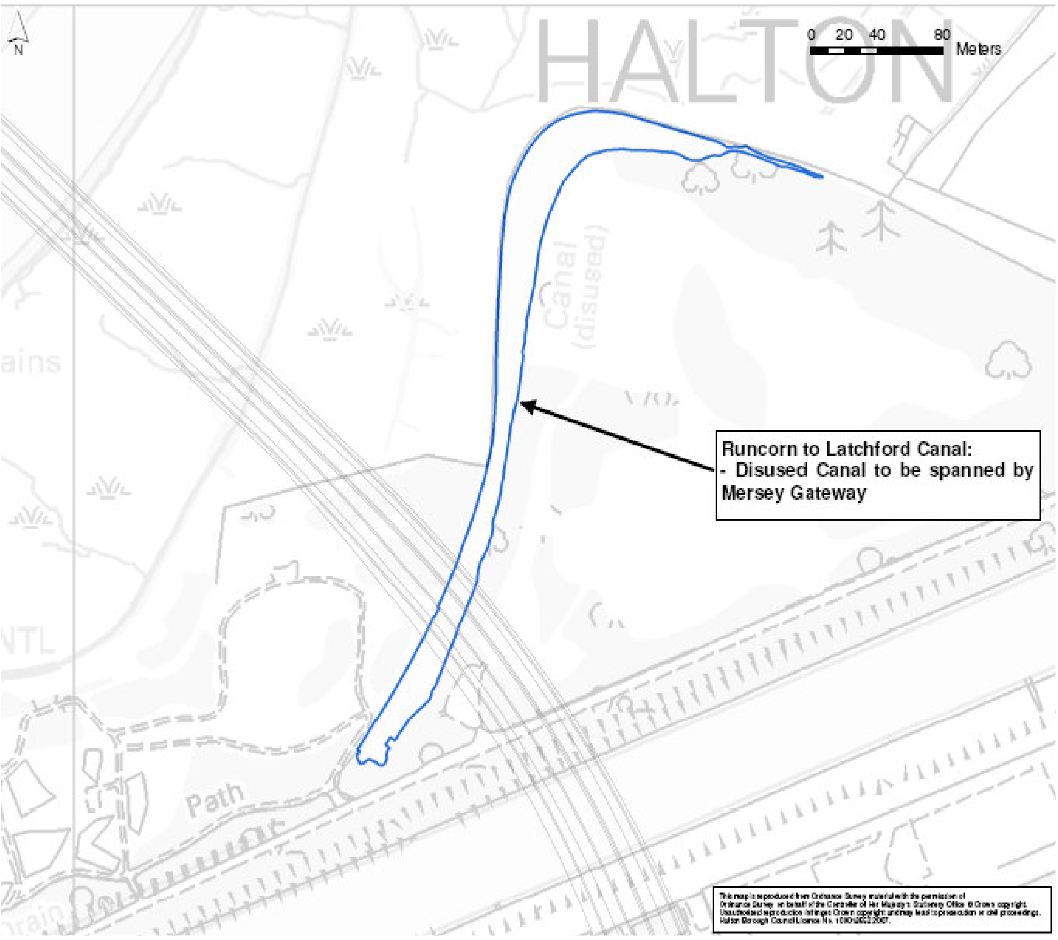
8.5.43 Figures 8.17 and 8.19 show that suspended solid concentrations vary considerably over time and between locations. There are no clear trends over time with respect to suspended solid concentrations and a high level of variability remains. This is as a result of the dynamic nature of the Estuary and changes in velocity as a result of the tidal regime. This is demonstrated in Figure 8.20 which charts the change in suspended solid concentrations over the course of one tidal cycle and the relationship between these concentrations to the tidal state as shown in Figure 8.21.

Latchford Canal

Watercourse Description

8.5.44 A small section of the Latchford Canal is located to the north of the Manchester Ship Canal. It is approximately 400m in length and 15m wide, orientated north east to south west. It is located on Wigg Island and was formerly part of the Latchford Canal prior to most of it being replaced by the Manchester Ship Canal. The location of the Latchford Canal is shown on Figure 8.22.

Figure 8.22 - Latchford Canal



8.5.45 The New Bridge will span the Latchford Canal at OSNGR 353230E 383647N. No construction works are proposed within the Latchford Canal itself.

Abstractions and Discharges

8.5.46 There are no registered abstraction licenses for the Latchford Canal.

8.5.47 Current registered discharges into the Latchford Canal which are covered under discharge consent issued by the EA are listed in Table 8.17.

Table 8.17 - Discharge Consents for the Latchford Canal

Operator	Distance and Bearing From Site	Discharge Type
Halton Borough Council	427m North West	Trade Discharges – Site Drainage (Contaminated Surface Water, Not Tips)

Halton Borough Council	427m North West	Trade Discharges – Site Drainage (Contaminated Surface Water, Not Tips)

8.5.48 From this data it is evident that there are currently no abstractions from the Latchford Canal. There are two current discharge consents issued by the EA. These are for discharges by the Council for the purpose of site drainage. It is not proposed to discharge any waters into the Latchford Canal from the Project.

Chemical Surface Water Quality

EA Data

8.5.49 The EA does not routinely monitor the Latchford Canal and no data is available for this body of water.

The Council's Data

8.5.50 Information regarding the Latchford Canal has been obtained from a study undertaken by the Council in 2006/2007 entitled 'Making the Most of Halton's Ponds' (the Council, 2007) (Ref. 19). The study primarily looked at the status of ponds within the borough, of which the Latchford Canal was considered.

8.5.51 The study stated that the area adjacent to the Latchford Canal, Wigg Island, was formerly used for the processing of copper waste from the production of sulphuric acid. A floating reed bed has been installed in the northern part of the Latchford Canal to absorb waste materials leaching into the canal from the surrounding land.

8.5.52 As part of the study the following water quality parameters were investigated:

a. Oxygen levels;
b. pH;
c. Conductivity;
d. Hardness; and
e. Ammonia.

8.5.53 The results of the study undertaken by the Council are not tabulated and therefore the results have been summarised in Table 8.18.

Table 8.18 - Water Quality Data for the Latchford Canal

Determinand	Comments
Oxygen	70%
pH	5.4 to 8.2 (mean of 7.9)
Conductivity	2.44mS (maximum of 2.92mS)
Hardness	1264mg CaCO3/l
Ammonia	Ammonia 3.5mg/l (mean value) and lowest value of 0.93mg/l

Analysis of Data

8.5.54 There is limited data for the Latchford Canal. However, based on the mean ammonia value the Latchford 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.

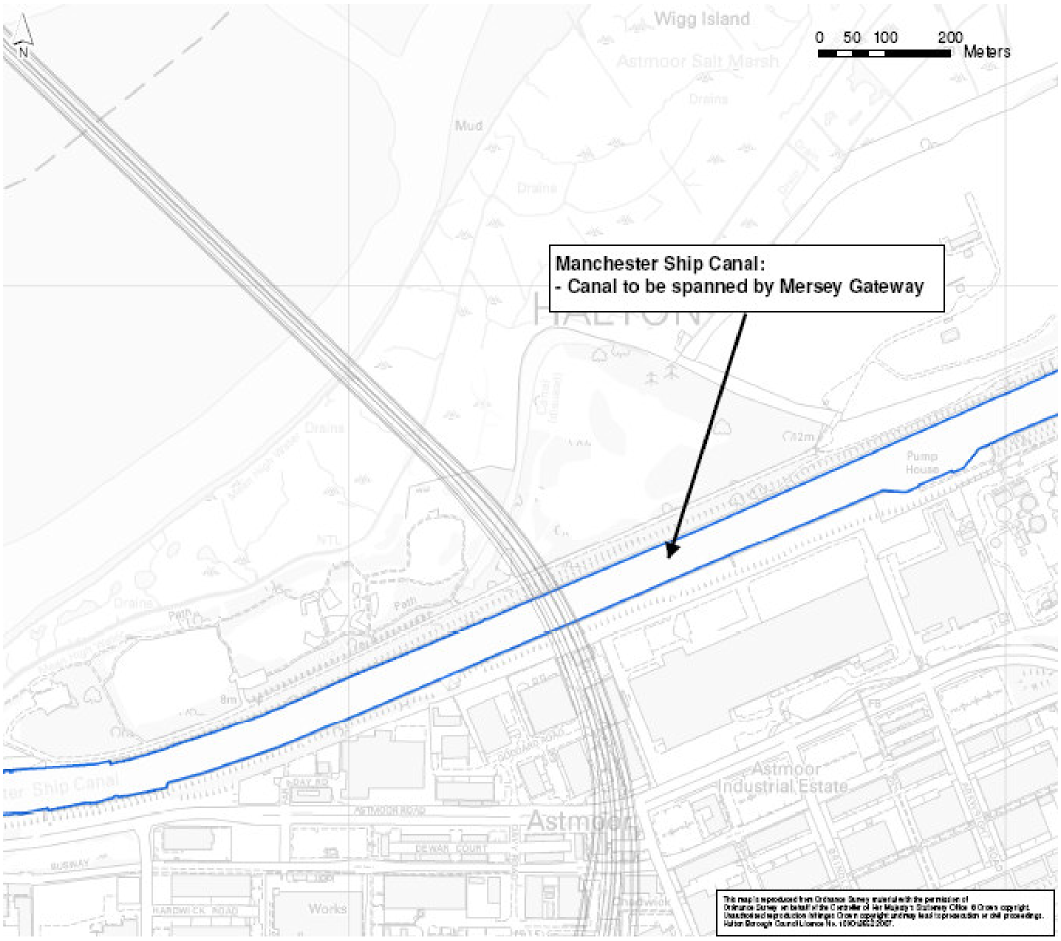
Manchester Ship Canal

Watercourse Description

8.5.55 The Manchester Ship Canal is a 56km long canal which is located between Eastham in Wirral and Salford in Greater Manchester. The Manchester Ship Canal provides deep water access for commercial shipping from the Estuary to Manchester.

8.5.56 The Project will span the Manchester Ship Canal from the approach spans over the saltmarsh to the Astmoor Viaduct at OSNGR 353310E 383530N. This is shown on Figure 8.23. The width of the Manchester Ship Canal is 60m at the point where the Project will cross it.

Figure 8.23 - Manchester Ship Canal



Abstractions and Discharges

8.5.57 There are no current registered abstraction licenses for the Manchester Ship Canal.

8.5.58 Current registered discharges into Manchester Ship Canal which are covered under discharge consent issued by the EA are listed in Table 8.19.

Table 8.19 - Discharge Consents for Manchester Ship Canal

Operator	Distance and Bearing From Site	Discharge Type
United Utilities Water Plc	286m North West	Storm/Emergency Overflow
United Utilities Water Plc	289m North West	Storm/Emergency Overflow
United Utilities Water Plc	303m North West	Storm/Emergency Overflow
United Utilities Water Plc	303m North West	Public Sewage: Storm Sewage Overflow
United Utilities Water Plc	303m North West	Public Sewage: Storm Sewage Overflow
United Utilities Water Plc	308m North West	Public Sewage: Storm Sewage Overflow
United Utilities Water Plc	874m West	Public Sewage: Storm Sewage Overflow
United Utilities Water Plc	876m West	Public Sewage: Storm Sewage Overflow
United Utilities Water Plc	912m North East	Sewage Discharges – Stormwater Storm Overflow/Storm Tank – Water Company
United Utilities Water Plc	913m North East	Sewage Discharges – Final/Treated Effluent – Water Company
United Utilities Water Plc	913m North East	Sewage Discharges – Stormwater Storm Overflow/Storm Tank – Water Company
United Utilities Water Plc	913m North East	Sewage Discharges – Stormwater Storm Overflow/Storm Tank – Water Company
United Utilities Water Plc	913m North East	Sewage Discharges – Final/Treated Effluent – Water Company
United Utilities	913m	Sewage Discharges – Stormwater Storm Overflow/Storm

Operator	Distance and Bearing From Site	Discharge Type
Water Plc	North East	Tank – Water Company
North West Water Ltd (NWW)	916m North East	Sewage Discharges – Final/Treated Effluent – Water Company
United Utilities Water Plc	953m West	Public Sewage: Storm Sewage Overflow
United Utilities Water Plc	960m North East	Storm/Emergency Overflow

8.5.59 From this data it is evident that there are currently no abstractions from the Manchester Ship Canal. There are a number of current discharge consents as issued by the EA. These are for discharges by United Utilities Plc for the purpose of sewage discharges.

Chemical Surface Water Quality

EA Data

8.5.60 The location of this monitoring point is shown on Figure 8.3. This monitoring point covers the length of the Manchester Ship Canal which is spanned by the Project.

Table 8.20 - Water Quality Chemical Status in the Manchester Ship Canal

Sampling Data Set	Year	Dissolved Oxygen (% saturation) 10-percentile		Biochemical Oxygen Demand (mg/l) 90-percentile		Ammonia (mgN/l) 90-percentile	
		Value	GQA Grade	Value	GQA Grade	Value	GQA Grade
Manchester Ship Canal below Runcorn ETW	2001-2003	30.5	**E**	4.174	**C**	2.554	**E**
	2004-2006	40.00	**E**	4.508	**C**	3.22	**E**

Analysis of Data

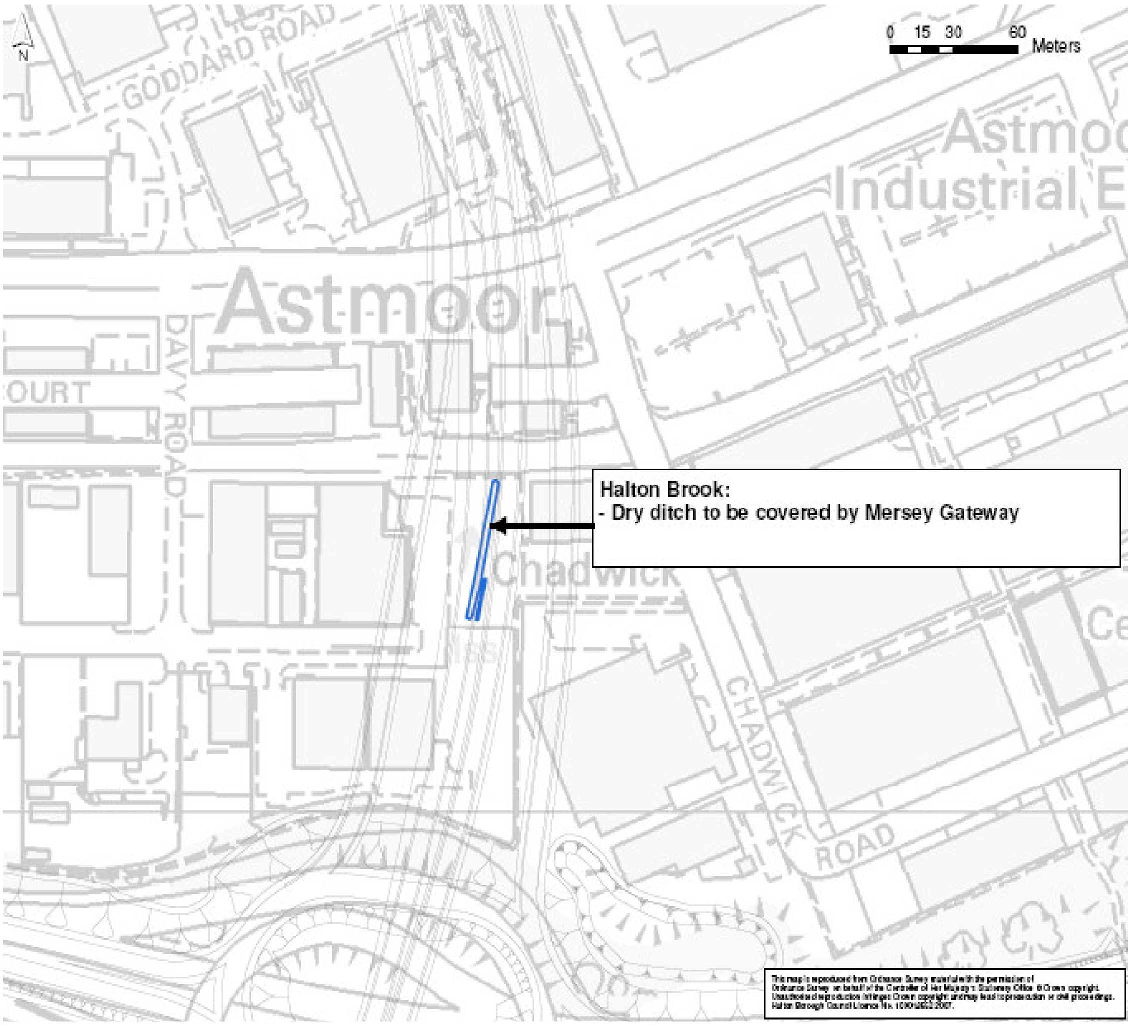
8.5.61 The most recent monitoring data for the Manchester Ship Canal indicates that the water quality has an overall GQA of ‘poor’.

Halton Brook

Watercourse Description

8.5.62 Halton Brook is located in Astmoor Industrial Estate and is shown on the OS map as a watercourse with its source marked as an 'issue' at OSNGR 353392E 383085N. The OS map shows that historically Halton Brook flowed in a northerly direction and is 64m in length. It should be noted however that no water has been found in Halton Brook during site inspections undertaken for the Project over the last two years. The location of Halton Brook is shown on Figure 8.24.

Figure 8.24 - Halton Brook



8.5.63 It is proposed that the Project will be located on piers in the area of Halton Brook. It is proposed to realign the channel of Halton Brook to the east of its current location. No piers are proposed within Halton Brook itself.

Abstractions and Discharges

8.5.64 There are no current registered abstractions or discharge consents for Halton Brook

Chemical Surface Water Quality

EA Data

8.5.65 Following consultation with the EA in 2007 it was reported that no water quality information was available for Halton Brook. This watercourse is not monitored by the EA because it is a dry ditch and not deemed an important watercourse.

Analysis of Data

8.5.1 No analysis is required for Halton Brook because it is a dry watercourse. For this reason it is not assessed as part of this chapter as there is no water to affect.

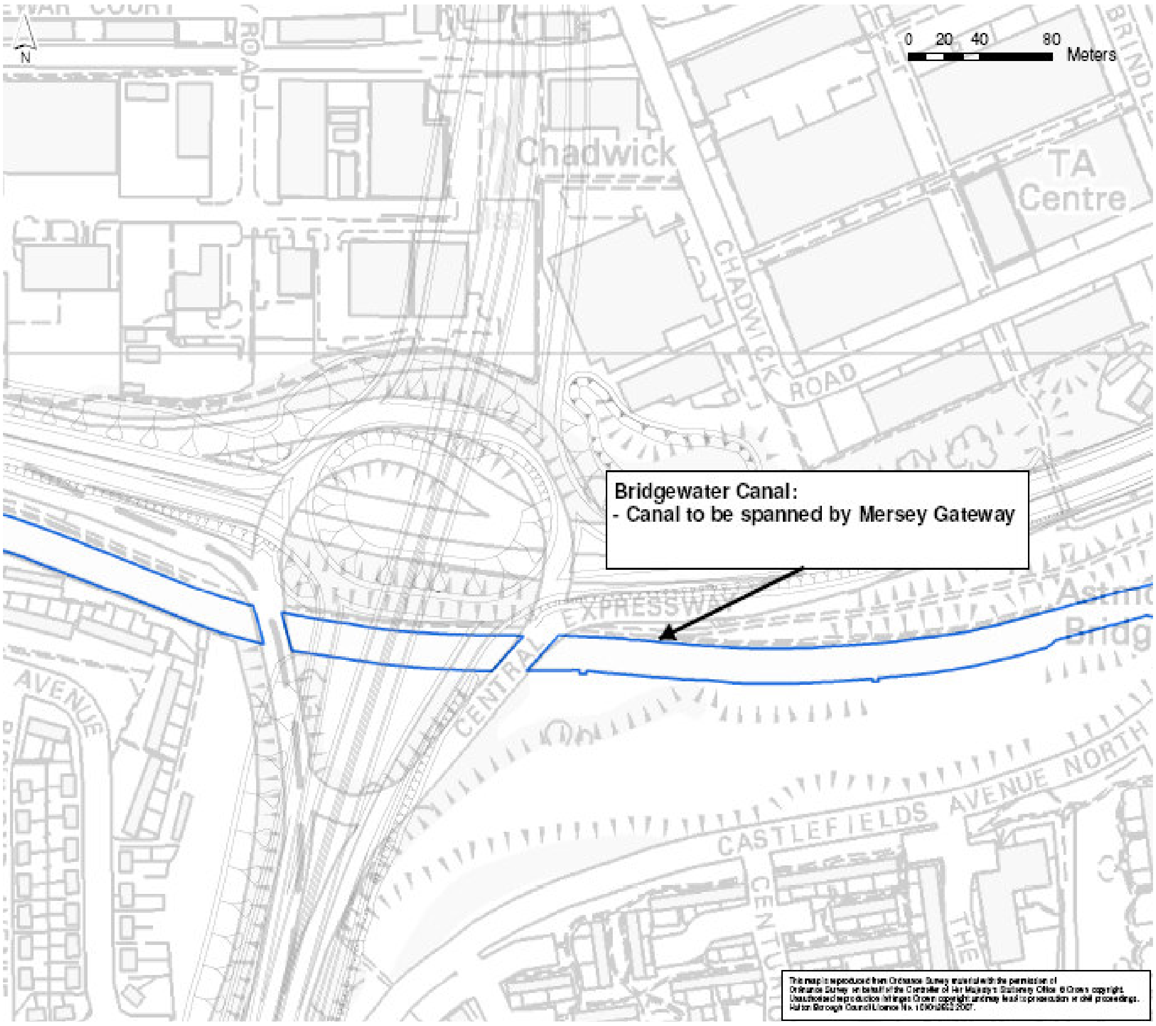
Bridgewater Canal

Watercourse Description

8.5.2 The Bridgewater Canal is 65km long and links Runcorn in Halton to Leigh in Lancashire.

8.5.3 The existing crossing of the Bridgewater Canal will be modified to incorporate the Project. This will include the construction of a new span over the Bridgewater Canal and two slip roads. The Project crosses the Bridgewater Canal at OSNGR 353327E 382840N. At this point the canal is approximately 20m wide. The location of the Bridgewater Canal is shown on Figure 8.25.

Figure 8.25 - Bridgewater Canal



8.5.4 No construction works are proposed within the Bridgewater Canal itself.

Abstractions and Discharges

8.5.5 There are no current registered abstraction licenses for the Bridgewater Canal.

8.5.6 Current registered discharges into Bridgewater Canal which are covered under discharge consent issued by the EA are listed in Table 8.21.

Table 8.21 - Discharge Consents for Bridgewater Canal

Operator	Distance and Bearing From Site	Discharge Type
United Utilities Water Plc	636m North West	Public Sewage: Storm Sewage Overflow
United Utilities Water Plc	736m East	Public Sewage: Storm Sewage Overflow

Chemical Surface Water Quality

EA Data

8.5.7 There is one EA water quality monitoring point located within the Bridgewater Canal. This is ‘Runcorn to Trent and Mersey Canal’ (Bridgewater Canal) and is located between OSNGR 350900E 382900N and OSNGR 356710E 380990N.

8.5.8 The location of this monitoring point is shown on Figure 8.3. This monitoring point covers the length of the Bridgewater Canal which is spanned by the Project.

8.5.9 The chemical status of the water quality for the Bridgewater Canal is shown in Table 8.22.

Table 8.22 - Water Quality Chemical Status in the Bridgewater Canal

Sampling Data Set	Year	Dissolved Oxygen (% saturation) 10-percentile		Biochemical Oxygen Demand (mg/l) 90-percentile		Ammonia (mgN/l) 90-percentile	
		Value	GQA Grade	Value	GQA Grade	Value	GQA Grade
Bridgewater Canal from Runcorn to the Trent and Mersey Canal	2001-2003	58.07	**D**	2.95	**B**	0.323	**B**
	2004-2006	58.29	**D**	3.37	**B**	0.274	**B**

Analysis of Data

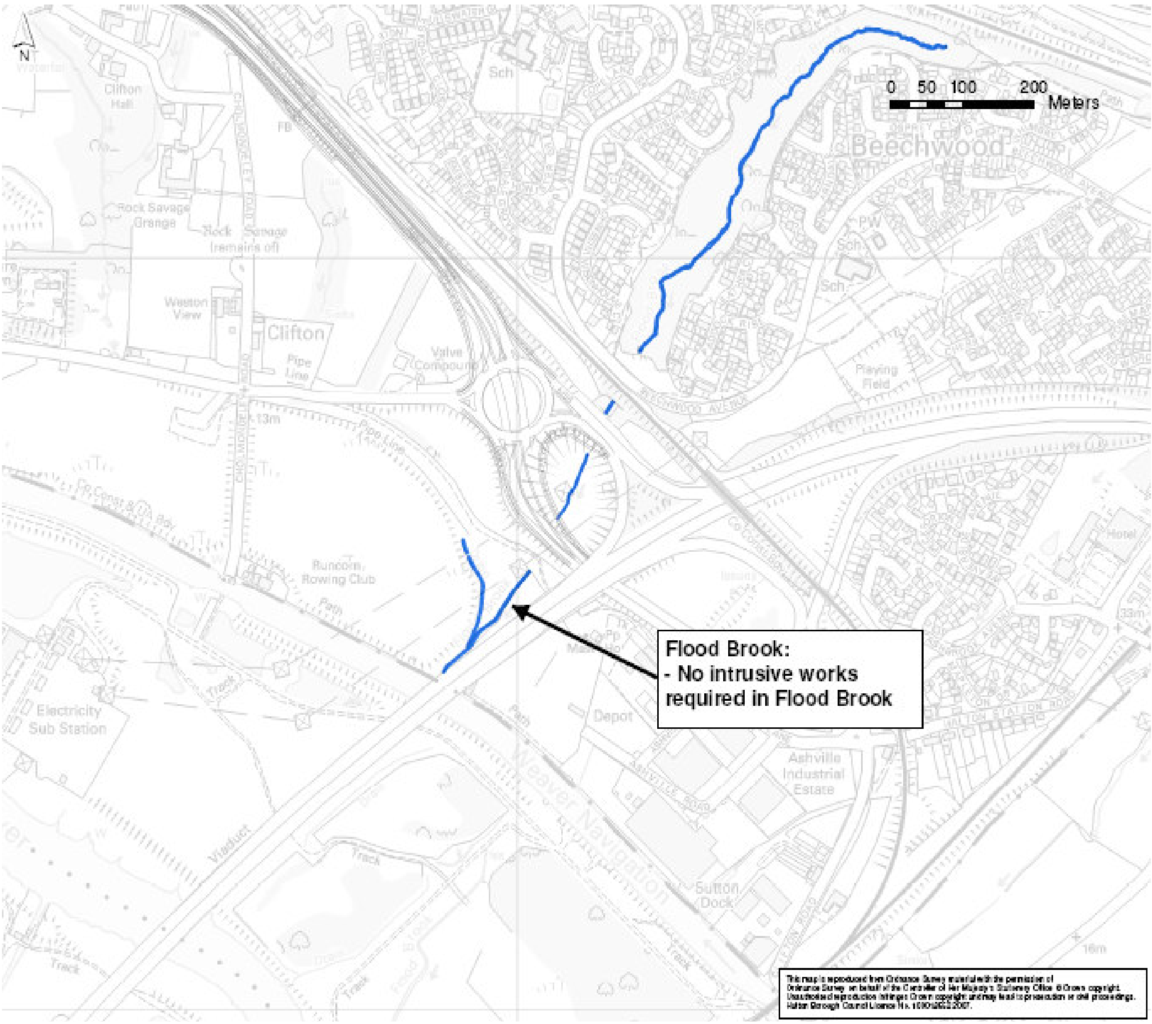
8.5.10 The most recent monitoring data for the Bridgewater Canal indicates that the water quality has an overall GQA of ‘fair’.

Flood Brook

Watercourse Description

8.5.11 Flood Brook is located within the southern part of Runcorn and has its source at OSNGR 353558E 380614N. The OS map shows the source marked as ‘issues’. It flows in a south easterly and south westerly direction before discharging into the Weaver Navigation at OSNGR 352895E 379436N. It has a total length of 1.7km and is 1m in width. The location of Flood Brook is shown on Figure 8.26.

Figure 8.26 - Flood Brook



8.5.12 Flood Brook is shown on the OS maps to flow beneath a number of existing carriageways in the southern part of Runcorn. These include the slip roads onto Junction 12 of the M56 motorway and the A583 Whitehouse Expressway.

8.5.13 The Project will include an improvement of the M56 Junction 12 roundabout. This will not involve any construction works within Flood Brook as the works will be undertaken within the existing highway boundary.

8.5.14 The existing road network in this area currently drains into Flood Brook without any attenuation or methods of improving water quality of the runoff. It is proposed that this discharge is continued as part of the Project but will be directed via a balancing pond. Details of this are discussed in the drainage strategy contained within the FRA (Appendix 8.2)

Abstractions and Discharges

8.5.15 There are no registered abstractions or discharge consents are located within Flood Brook. However, the drainage strategy included as part of the FRA has stated that the existing road runoff currently drains into Flood Brook. This type of discharge is exempt from discharge consent under the Highways Act 1980.

Chemical Surface Water Quality

EA Data

8.5.16 The EA do not routinely monitor Flood Brook as part of their GQA monitoring. Following consultation with the EA in 2007 it was reported that no water quality information was available for Flood Brook.

Analysis of Data

8.5.17 The extent of works at Flood Brook is restricted to works adjacent to the watercourse. For the purpose of the assessment undertaken in section 8.7 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.

Contamination to Watercourses Due to Road Runoff

8.5.18 An assessment of pollution effects to watercourses due to routine runoff can be established by using the methodology set out in DMRB guidance document. The assessment estimates whether the addition of runoff will increase the watercourse baseline copper and zinc concentrations above the relevant EQS threshold. Drainage from the scheme to watercourses will be via St Helens Canal, Stewards Brook and Flood Brook. The baseline water quality of Stewards Brook and the St Helens Canal includes concentrations of copper and zinc in excess of the EQS threshold. Surface road runoff from the existing road network is currently discharged into Flood Brook with no attenuation or methods to improve the quality of runoff. The discharge of water from the Project should be of a quality so as to not decrease the existing water quality in these watercourses. This will be undertaken through the contaminant and pollution controls as part of the drainage design.

8.5.19 The assessment of pollution effects from accidental spillages can also be assessed using the methodology set out in DMRB guidance document (DMRB Volume 11, Section 3 Part 10). The assessment concluded that the probability of a spillage accident with an associated risk of a serious pollution incident occurring is 0.27% for Stewards Brook and 0.05% for the St Helens Canal. The calculations are included in Appendix 8.4.

8.6 Effect Assessment

Construction Phase Effects

8.6.1 The effects likely to occur at each water body, which have the potential to affect surface water quality and have been considered as part of the assessment, are as follows. It should be noted that effects to the ecology of the water bodies are considered within the relevant chapter of this ES (Chapter 10 Terrestrial and Avian Ecology and Chapter 11 Aquatic Ecology).

Table 8.23 - Construction Phase Effects

Water Body	Construction Phase Effect
Stewards Brook	Mobilisation of contaminants from land on the former St. Michaels Golf Course through construction of the culvert extension.
	Accidental spillage of pollutants such as fuel oils, concrete/cement, suspended solids from run off etc.
Bowers Brook	Accidental spillage of pollutants such as fuel oils, concrete/cement, suspended solids from run off etc.
	Mobilisation of contaminated sediments during the culverting of the open sections of the brook.
	Mobilisation of chlorinated solvents into Bowers brook as a result of development on the Catalyst Trade Park site
St. Helens Canal	Accidental spillage of pollutants such as fuel oils from mechanical plant and bowsers, concrete/cement from construction of piles etc.
	Mobilisation fines from stone used to temporarily infill the canal to allow construction plant to access the saltmarsh.
The Estuary (specifically the Upper Mersey)	Increased sediment load in the water column from construction of a piled jetty and cofferdams.
	Mobilisation of potentially contaminated sediments through scour action around the cofferdams.
	Accidental spillage of pollutants such as fuel oils, concrete/cement, suspended solids from run off etc.
Latchford Canal	Accidental spillage of pollutants such as fuel oils, concrete/cement, suspended solids from run off etc.
Manchester Ship Canal	Accidental spillage of pollutants such as fuel oils, concrete/cement, suspended solids from run off etc.
Halton Brook	No impact identified as no water present within the watercourse.
Bridgewater Canal	Accidental spillage of pollutants such as fuel oils, concrete/cement, suspended solids from run off etc.
Flood Brook	Accidental spillage of pollutants such as fuel oils, concrete/cement, suspended solids from run off etc.

8.6.2 The effects identified in Table 8.23 have been assessed without mitigation based on the assessment criteria. The outcome of the assessment is shown in Table 8.25.

Stewards Brook

8.6.3 Stewards Brook downstream of the Project has a chemical GQA of 'bad' and has therefore been classed as being of low importance. This has been used as part of the assessment rather than the upstream monitoring location (which has a GQA of 'good') as the downstream monitoring location will receive any potential effect in water quality from the Project.

8.6.4 The mobilisation of contaminated land from the adjacent land on the former St. Michaels Golf Course and the accidental spillage of pollutants during construction have been considered as they have the potential to have an adverse effect on the water quality of Stewards Brook. These are considered to be a moderate effect, and are considered to be of low negative significance because, although the brook downstream of the Project already has a 'bad' GQA score, it would further decrease the water quality of the brook. The effect is also considered to be short term and temporary in nature.

8.6.5 Mitigation measures have been recommended in Section 8.8 of this chapter to minimise the significance of the effect.

Bowers Brook

8.6.6 Although the monitoring location upstream of the Project has a chemical GQA grade of 'good', the historical GQA grade of 'bad' and the presence of chlorinated solvents within the brook indicate that Bowers Brook is of low importance.

8.6.7 There is potential that the construction of the culvert in the open sections of Bowers Brook may mobilise contaminated sediments in the brook. This is considered to be a moderate effect because it will result in a measurable change in the quality of the brook's water quality. The effect is also considered to be short term and temporary in nature.

8.6.8 There is also potential that accidental spillages may occur at the site of the Project which may affect Bowers Brook. It is considered that this is a moderate effect as it will have a detrimental change to water quality in the brook. The effect is also considered to be short term and temporary in nature. This is considered to be of low negative significance.

8.6.9 Chlorinated solvents present in the Catalyst Trade Park site have been detected in water samples taken in Bowers Brook. Construction of the Widnes Loops Junction on the site of the Catalyst Trade Park site may exacerbate the existing mobilisation of chlorinated solvents in the soils in that area. These effects are considered to be a moderate effect as it will result in a measurable detrimental change to the water quality of the brook. This will result in a low significant effect.

8.6.10 Mitigation measures have been recommended in Section 8.8 to minimise the significance of the effect.

St Helens Canal

8.6.11 The St Helens Canal has been classed as being of moderate importance as it has a chemical GQA of 'fair'.

8.6.12 An accidental spillage of a pollutant such as fuel into the canal is considered to be a moderate effect resulting in moderate negative significance as it would detrimentally affect water quality. The effect is also considered to be short term and temporary in nature.

8.6.13 The infilling of the canal during the construction phase to allow construction plant to cross the canal has been considered to be a moderate effect as it has the potential to release fines into the canal which in turn may increase sediment loading in the water column. The effect is also considered to be short term and temporary in nature. This is considered to be of moderate negative significance.

The Estuary

Effects of Scour in the Estuary

8.6.14 It is reported in Chapter 7 that the piled jetty will not result in any significant scour given the relatively small diameter of these piles and the short term duration for which they will be required. This was shown during the site investigation of the Estuary whereby a jack-up barge was used to retrieve sediment samples.

8.6.15 One of the key concerns relates to the effects of the potential liberation and mobilisation of contaminated sediments upon the ecology of the Estuary system.

8.6.16 The upper sediment zone (to depths of approximately 0.7m) in the Estuary in the study area is highly mobile and continually mixed through the process of erosion and deposition. This phenomenon means that samples of sediment collected from this zone are not necessarily representative of the general sediment quality of that area.

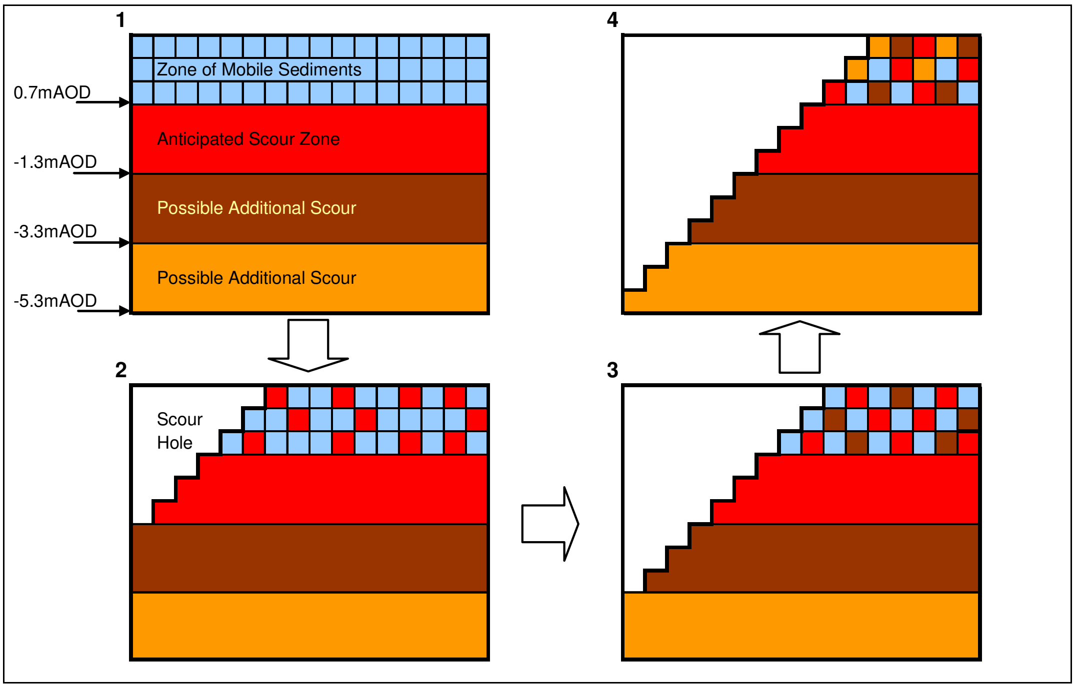
8.6.17 For this reason, the shallow scouring around the piles of the temporary jetty proposed for use during construction has no significant effect on water quality within the Estuary. There is no increased risk from contamination entering the water column from these sediments as these materials are within the mobile zone.

8.6.18 Similarly, the use of the existing channels in the Estuary for the movement of shallow draft construction vessels or hover craft or hover platforms does not impact on material below this upper sediment zone and is therefore not considered further in this assessment.

8.6.19 Based on the findings of the Hydrodynamics and Estuarine Processes chapter the intertidal zone was divided into the mobile (above 0.7m AOD) and scoured depth zone (sediments above -1.3m AOD). In order to assess the potential impact from deeper scouring than has been predicted at present, two additional 2m depth zones were created, these were for sediments above -3.3m AOD and sediments above -5.3m AOD. The data obtained during investigations for the Contamination of Soils, Sediments and Groundwater chapter (chapter 14) was used for the Poly Aromatic Hydrocarbons (PAHs) assessment due to the lower analytical detection limits.

8.6.20 It is assumed that scoured sediments would mix with those already in the mobile zone, this is shown in Figure 8.27 below. The statistical tests were, therefore, undertaken on data from mobile sediments and for all sediments from surface down to the base of each of the scoured horizons. A total of four datasets were created representing the mobile zone for each of the scenarios shown in Figure 8.13.

Figure 8.27 - Conceptualisation of Scouring and Sediment Mixing



8.6.21 The 95th percentile of contaminant concentrations for each dataset was calculated using the mean value test from CLR7 (2002) and compared to that for the zone of mobile sediments. The results are included within the Contamination of Soils, Sediments and Groundwater chapter (chapter 14). The results of the statistical tests are shown in Figures 8.28 and 8.29 for metals and PAHs respectively.

Figure 8.28 - Comparison of 95th Percentile Metal Concentrations

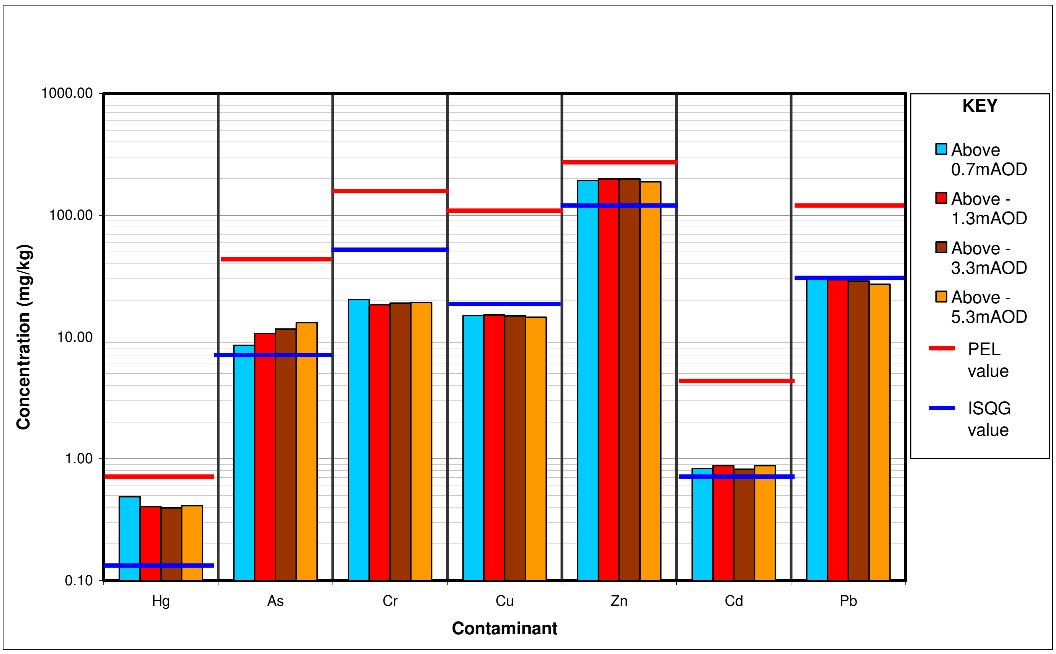
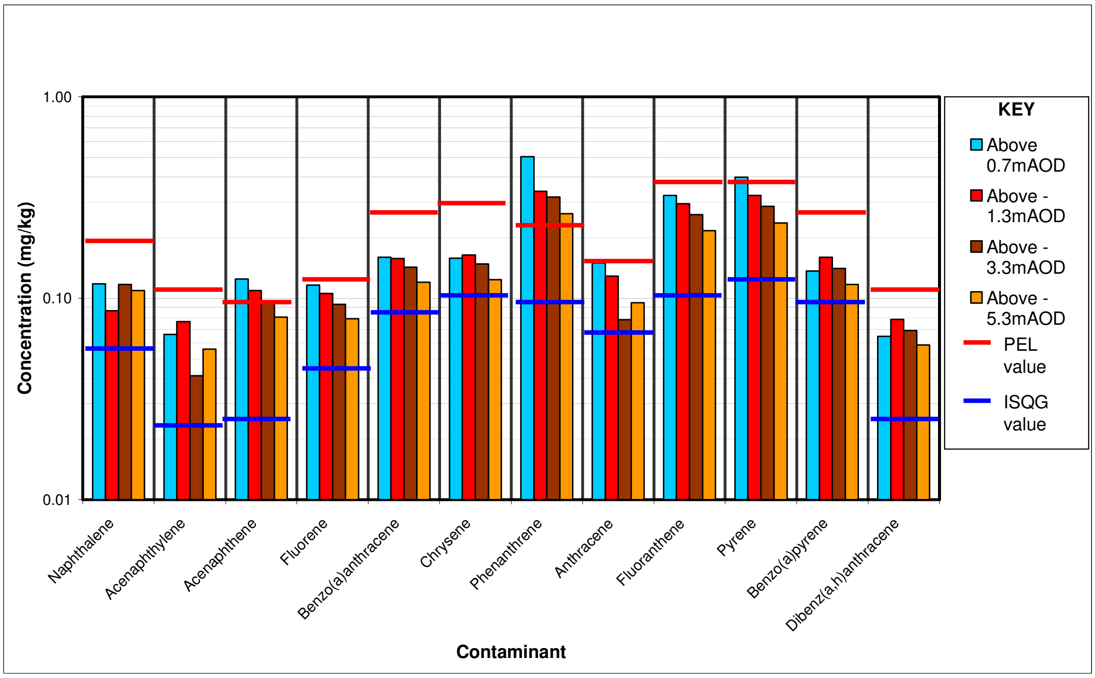


Figure 8.29 - Comparison of 95th Percentile PAH Concentrations



8.6.22 The 95th percentiles derived for metals and PAH in the intertidal zone already exceed the ISQG values, with the exception of chromium and copper. A number of PAHs also exceed PEL values.

8.6.23 The results from this study indicate a possible slight increase in the concentration for arsenic with scouring, although this increase would be very small. Although the chemical testing results for arsenic in the mobile Estuary sediments already exceed the ISQG, they would not exceed the PEL.

8.6.24 The assessment for acenaphthylene, chrysene, benzo(a)pyrene and dibenzo(a,h)anthracene indicates that a very slight increase in concentration could be obtained from scouring down to -1.3m AOD. However, the assessment indicates that scouring to greater depths could result in a reduction for these PAHs concentrations within the mobile zone.

8.6.25 The results of the statistical assessment indicate that scouring of deeper sediments and mixing with sediments in the mobile zone would produce very little change in metal contaminant concentrations, and for PAHs a general trend of decreasing concentrations is likely to be obtained from successive scouring.

8.6.26 Even if contaminants were associated with particular horizons in the area of scouring, their liberation from scouring would be a one-off occurrence. However, the results indicate that scouring would not produce any additional exceedances of ISQG or PEL values within the near-surface mobile sediment zone in the Project area.

8.6.27 The volume of sediment estimated to scour from around each cofferdam is 134.7m^3 (see Chapter 7; Hydrodynamics and Estuarine Processes). Due to the high levels of dilution and dispersal that will occur within the Estuary, this increased sediment load within the water column is expected to cause a negligible change to water quality. For example should this volume of sediment scour out in one event from around all three cofferdams, the resultant quantity of sediment is 404.1m^3 and this would only cover an area of 0.1km^2 to a depth of 1mm. The study area itself is in excess of 1km^2.

8.6.28 The Estuary has been classed as being of moderate importance as it has a chemical GQA of 'fair'.

8.6.29 It is considered that the effect of the construction of a piled jetty, cofferdams increasing sediment load and mobilising potentially contaminative sediments in the Estuary is negligible. Investigation has shown that there will be no adverse effects from scour adjacent to the bridge towers on water quality within the Estuary. Dilution within the tidal prism of the Estuary will minimise the effect. Therefore, the effect has been categorised as low negative significance**.**

8.6.30 There is a potential for a reduction in water quality around the cofferdams as a result of mobilisation of contaminated sediments through piling activities (both insertion and removal) at depth. The assessment of the sediments in the Estuary in chapter 14 shows only moderate contamination and no variation in contaminant concentration with depth. It is considered unlikely that sediments released by piling would cause a change in water quality within the Estuary.

8.6.31 The increase in sediment load due to scouring is likely to introduce further oxygen depleting processes. Analysis of dissolved oxygen concentrations at locations corresponding to the planned footprints of the three tower sites concluded that the potential for scour could increase the overall oxygen demand of the water immediately above the scour area by 17%, although this localised effect would be dissipated by dispersion. The overall effect on water quality is expected to be low. The effect would be associated with the development of the scour hole once the towers are constructed and subsequent changes in the scoured area would be minimal and related to tidal and weather driven effects. Any changes in oxygen demand from this would be no different to those which occur now within the Estuary as sediment erosion and deposition takes place.

8.6.32 Based on the above the effect of scour around the piles and cofferdams on water quality is considered to be of low significance.

8.6.33 The spillage of chemicals or materials into the Estuary during the construction process would have a detrimental effect on water quality of the Estuary relative to the quantity and nature of the material that is released. Water quality within the Estuary study area is currently classed as 'fair' and has a high dilution capacity. The Middle Estuary is designated as a Special Protection Area (SPA), a Ramsar site and a European Marine Site. It is considered that this is a high effect based on a worst case incident such as a catastrophic failure of a fuel tank. This is considered to be a moderate negative significant effect.

Latchford Canal

8.6.34 The Latchford Canal is considered to be of low importance as it has a 'poor' GQA grade. An accidental spillage of fuel, oils or other pollutants is considered to be of moderate magnitude. The effect is considered to be of low negative significance. The effect is also considered to be short term and temporary in nature.

Manchester Ship Canal

8.6.35 Manchester Ship Canal is considered to be of low importance as it has a chemical GQA grade of 'poor'. An accidental spillage of fuel, oils or other pollutants is considered to be a moderate effect. The effect is considered to be of low negative significance. The effect is also considered to be short term and temporary in nature.

Halton Brook

8.6.36 Halton Brook has not been assessed as there is no water present within the watercourse therefore there are no effects.

Bridgewater Canal

8.6.37 Bridgewater Canal is considered to be of moderate importance as it has a 'fair' GQA grade. An accidental spillage of fuel, oils or other pollutants is considered to be a moderate effect. The effect is considered to be of moderate negative significance.

Flood Brook

8.6.38 Flood Brook has been assessed conservatively as no GQA data is available for this watercourse. It has therefore been classed as being of moderate importance as it is likely to have a GQA grade of 'fairly good' or 'fair' based on its size and is currently used for the discharge of unattenuated road runoff. An accidental spillage of fuel, oils or other pollutants is considered to be a moderate effect. The effect is considered to be of moderate negative significance. The effect is also considered to be short term and temporary in nature.

Mersey Gateway – Operation Phase Effects

8.6.39 The following operation effects to surface water quality have been identified:

Table 8.24 - Operation Phase Effects

Water Body	Operation Phase Effect
Stewards Brook	Routine runoff and spillage of chemicals from roads into surface water courses.
St Helens Canal	Routine runoff and spillage of chemicals from roads into surface water courses.
Flood Brook	Routine runoff and spillage of chemicals from roads into surface water courses

8.6.40 The effects identified in Table 8.24 have been assessed without mitigation based on the assessment criteria in Section 8.5. The outcome of the assessment is shown in Tables 8.25.

Stewards Brook

8.6.41 Stewards Brook has been classed as being of low importance as it has a chemical GQA of 'bad'.

8.6.42 It is proposed to use Stewards Brook as a receiving water for routine runoff from the Project. This will be via attenuation ponds to be located next to the brook. In the event of an accidental spillage on the Project this may flow into Stewards Brook.

8.6.43 The assessment of pollution effects from accidental spillages has been assessed using the methodology set out in DMRB guidance document. As a guide watercourses should be protected so that the risk of a serious pollution incident has an annual probability of less than 1%.

8.6.44 Using projected traffic information derived from the Project transport assessment (Chapter 16) for the Project the risks to Stewards Brook are well below 1% (0.21%). The risk to water quality from pollution due to accidental spillages is, therefore, not likely to be an effect as a result of the scheme. For the assessment a traffic flow of 35801 vpd was used. This was derived based on the traffic modelling assessment for the length of carriageway over this part of the Project.

8.6.45 This is considered to be of low magnitude, and is therefore considered to be not significant.

St Helens Canal

8.6.46 The St Helens Canal has been classed as being of moderate importance as it has a chemical GQA of ‘fair’.

8.6.47 It is proposed to use the St Helens Canal as receiving water for routine runoff from the Project. This will be via attenuation ponds to be located next to the canal. In the event of an accidental spillage on the Project this may flow into the St Helens Canal.

8.6.48 The assessment of pollution effects from accidental spillages has been assessed using the methodology set out in DMRB guidance document. As a guide watercourses should be protected so that the risk of a serious pollution incident has an annual probability of less than 1%.

8.6.49 Using projected traffic information for the New Bridge the risks to St Helens Canal are well below 1% (0.05%) and so the risk to water quality from pollution due to accidental spillages is not likely to be an effect as a result of the scheme. For the assessment a traffic flow of 36055 vpd was used. This was derived using the traffic numbers from the transport assessment (Chapter 16) for that stretch of carriageway of the Project.

8.6.50 This is considered to be a low magnitude effect, and is considered to be of low negative significance.

Flood Brook

8.6.51 For the purpose of the assessment Flood Brook has been classed as being of moderate importance as no existing water quality is available. Therefore, a conservative approach has been used.

8.6.52 It is proposed to use Flood Brook as a receiving water for routine runoff from the Project. This will be via a balancing pond located at the Lodge Lane Junction. In the event of an accidental spillage on the Project this may flow into Flood Brook.

8.6.53 The assessment of pollution effects from accidental spillages has been assessed using the methodology set out in DMRB guidance document. As a guide watercourses should be protected so that the risk of a serious pollution incident has an annual probability of less than 1%.

8.6.54 Using projected traffic information for the new bridge the risks to Flood Brook are well below 1% (0.22%) and so the risk to water quality from pollution due to accidental spillages is not likely to be an effect as a result of the Project. For the assessment a traffic flow of 45792 vpd was used. This was derived using the traffic numbers from the transport assessment (Chapter 16) for that stretch of carriageway of the Project.

8.6.55 This is considered to be a low magnitude effect, and is considered to be of low negative significance.

Table 8.25 - Assessment of Potentially Significant Effects

Effect	**Receptor and importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)
Construction Phase			
Extension of culverts	Water quality in Stewards Brook Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance
	Water quality in Bowers Brook Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance
Accidental spillage of pollutants such as fuels, oils, concrete/cement, suspended solids from runoff etc.	Water quality in Stewards Brook Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance
	Water quality in Bowers Brook Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance
	Water quality in the St Helens Canal Moderate Importance	Negative Short Term Temporary Direct Moderate Magnitude	Moderate Negative Significance

Effect	**Receptor and importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)
	Water quality in the Estuary Moderate Importance	Negative Short Term Temporary Direct High Magnitude	Moderate Negative Significance
	Water quality in the Latchford Canal Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance
	Water quality in the Manchester Ship Canal Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance
	Water quality in the Bridgewater Canal Moderate Importance	Negative Short Term Temporary Direct Moderate Magnitude	Moderate Negative Significance
	Water quality in Flood Brook Moderate Importance	Negative Short Term Temporary Direct Moderate Magnitude	Moderate Negative Significance
Mobilisation of chlorinated solvents into Bowers Brook as a	Water quality in Bowers Brook	Negative Short Term Temporary	Low Negative Significance

Effect	**Receptor and importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)
result of the development on the Catalyst Trade Park site	Low Importance	Direct Moderate Magnitude	
Mobilisation of Fines from Stone used to temporarily infill the St Helens Canal to allow construction plant to access the saltmarsh	Water quality in the St Helens Canal Moderate Importance	Negative Short Term Temporary Direct Moderate Magnitude	Moderate Negative Significance
Increased sediment load in the water column from construction of a piled jetty and cofferdams in the Estuary	Water quality in the River Moderate Importance	Negative Short Term Temporary Direct Low Magnitude	Low Negative Significance
Mobilisation of potentially contaminated sediments through scour action around the cofferdams.	Water quality in the River Moderate Importance	Negative Short Term Temporary Direct Low Magnitude	Low Negative Significance
Operation Phase			
Routine runoff and spillage of chemicals from roads into surface water courses	Water quality in Stewards Brook Low Importance	Low Magnitude	Not Significant
	Water quality in the St Helens Canal Moderate Importance	Negative Short Term Temporary Direct Low Magnitude	Low Negative Significance

Effect	**Receptor and importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)
	Water quality in Flood Brook Moderate Importance	Negative Short Term Temporary Direct Low Magnitude	Low Negative Significance

8.7 Mitigation, Compensation, Enhancement and Monitoring

Introduction

8.7.1 Mitigation of significant negative effects identified in previous section the can be applied through design 'management techniques' and 'physical techniques'. These are discussed below.

8.7.2 Compensation measures are those measures which are adopted to replace elements "lost" due to the Project. In surface water terms there are no compensation measures proposed, as no direct loss of any watercourse and in overall terms water quality should improve in the longer term due to the design of the drainage scheme.

8.7.3 Enhancement measures are management or physical techniques which improve a positive effect identified in the previous section of this chapter. In surface water terms there are no enhancement measures proposed for the Project.

Mitigation - Management Techniques

Construction Phase

8.7.4 The contractor will be required to produce and implement an Environmental Management Plan (EMP) as part of the tender process. During the construction period, the EMP will be specific to construction processes and this will form a Construction Environmental Management Plan (CEMP). The CEMP and EMP will be produced by the concessionaire and this should be secured by condition. However the main elements of these plans are given in Chapter 23 of this Environmental Statement.

8.7.5 The CEMP will comprise of a series of management plans, to incorporate environmental best practice. These will be controlled and maintained through a CEMP. The specific plans of relevance to surface water quality are:

a. Pollution Control and Contingency Plan (including cofferdam dewatering); and a
b. Water Management Plan (Surface and Groundwater).

8.7.6 Other management plans which are not specifically relevant to surface water quality but influence surface water matters:

a. Landscape and Ecology Management Plan;
b. Contaminated Land Management Plan;
c. Biodiversity Protection Plan;
d. Noise and Vibration Management Plan;
e. Archaeological and Cultural Heritage Management Plan;
f. Waste and Resource Management Plan;
g. Air Quality Plan; and
h. Site Waste Management Plan.

8.7.7 The elements of each of these plans are detailed in Chapter 23 of this ES. Of particular note, however are the following elements, which will allow control and monitoring of the effects of the construction phase to be monitored and action plans/remedial actions to be put into place:

a. Management procedures for the management of liquid discharges to the surface water environment;
b. Management procedure which includes emergency and contingency plans for incidents which potentially affect the water environment;
c. Roles and responsibilities of site staff with regard to the water environment;
d. Monitoring requirements (where, when, how and by who) for the water environment (see also below);

e. Reporting procedures, including non-compliance and change control procedures, emergency and regular monitoring reporting;
f. Training for all site staff in environmental matters; and
g. Audit and check procedures, including observation and hold points to enable the Council to stop unacceptable construction processes which are at risk of causing environmental processes.

8.7.8 The CEMP will be the responsibility of an experienced Environmental Manager who is part of the Concessionaire's Management Team and has direct access to the Concessionaire's Project Manager.

Operation Phase

8.7.9 Post construction, the EMP will continue to require the management of discharges to the environment. The requirements of the EMP are given in Chapter 23 of this ES. As with the CEMP, the EMP will be implemented by the concessionaire under a management agreement with the Council. The EMP will include management plans for monitoring, auditing and reporting of discharges to the water environment for the bridge and any other elements of the design deemed necessary.

8.7.10 The concession will last for a defined period. At the end of the concession, the future of the management of the Project assets will be decided by the Council. Should this involve the change in management of the Project assets, the concessionaire will be required to prepare a Handover Environmental Management and Mitigation Plan (HEMP). This will detail all management measures employed for control of emissions to the water environment as well as the results of ay monitoring undertaken, non-compliance procedures, audits, prohibition or enforcement notices. This will allow the subsequent managers of the Project assets to understand the history of those assets with regard to the water environment.

Physical Techniques

Construction Phase

8.7.11 Physical techniques will be employed during the construction process. The actual mechanisms to be used should be secured by condition and will depend upon discussions and agreements between the Concessionaire and the Council and EA. These could include:

a. All fuel storage will occur within bunded fuel tanks with a bund capacity of over 110% of the tank volume. These tanks will be properly maintained and have fuel filler facilities within the tank. A minimum volume of fuel will be stored on site. The location of all fuel storage will be such that it minimises the risks to surface and groundwater;
b. Construction compounds will be hard surfaced where possible with self contained surface water collection and management systems;
c. Oil/water separators will be used on the construction compounds surface water management systems to remove oils and fuels accidentally spilled/accumulated during operation of the Project. These are to be maintained in accordance with the manufactures instructions to ensure they remain efficient;
d. Bunded areas for the waste quarantine and pre-segregation areas. Stockpiles of contaminated or suspect material will be sheeted to minimise runoff;
e. All chemical and other stores will use appropriate containers. Spill mats and drip trays will be used wherever necessary;
f. Spill Control kits will be available and maintained at all compounds and works where these are adjacent to watercourses;
g. Measures to prevent the reintroduction of suspended solids into watercourses will be incorporated into temporary works such as earthwork areas, haul routes and compounds.

No exposed stockpiles will be located within an agreed distance of principal water courses;

h. Appropriate measures will be taken where contaminated soils and groundwater are to be excavated/removed. All contaminated groundwaters will be collected and stored prior to monitoring and disposal. Appropriate disposal techniques will be used in Accordance with the Duty of Care Regulations;

i. No storage of contaminated soils will occur within 20m of principal water courses unless this is on dedicated engineered and bunded areas. Contaminated waste will be stored for a minimum of time prior to removal for management and disposal;

j. Surface runoff will be stored and monitored in accordance with the requirements of discharge consents negotiated with the EA; and

k. Any wheel washes used in site compounds will have self contained water collection systems and these waters will be monitored prior to discharge.

8.7.12 For works within the River physical measures should be used to minimise the release of sediments. This could include the use of silt nets during piling activities.

8.7.13 For the infilling of the St Helens Canal for use by construction plant to access the saltmarsh a chemically inert stone should be used such as granite or shale to minimise the release of fines into the water column. In addition to this the stone should be pre-washed in a controlled area (i.e. away from sensitive areas such as watercourses) to remove any fines prior to infilling the canal.

Operation Phase - Mitigation through Scheme Design

8.7.14 A drainage strategy has been developed which incorporates elements of the design which will control discharges from the new infrastructure assets to the surface water environment. This is included as part of the FRA in Appendix 8.2**.**

8.7.15 Appropriate design standards should be utilised such as the EA Pollution Prevention Guidelines and DMRB for all temporary and permanent works.

8.7.16 The use of balancing ponds and swales will control the flow of runoff into the designated watercourses and minimise the potential for scour of sediments and input of suspended sediments from routine road runoff. The location of these facilities will be confirmed by the Concessionaire in the detailed design. However, at present it is proposed to provide two balancing ponds at the Main Toll Plaza's on the former St. Michaels Golf Course, a swale south of the Widnes Loops and a balancing pond at the Lodge Lane Junction which discharges into Flood Brook. These features will be fitted with spill and pollution control equipment to deal with possible accidents in these locations. These requirements should be secured by condition.

8.7.17 The use of interceptors and filter drains will minimise the pollutant input from routine runoff and spillage of chemicals from roads into surface water courses that may occur. The locations of these have not been derived at this stage but it is recommended that they are located at key locations of the Project such as the main toll plaza.

8.7.18 Routine highway runoff will be discharged into Stewards Brook, St Helens Canal and Flood Brook and this will have a beneficial effect on water quality in these watercourses as it will have a diluting effect on the water currently in the watercourses. All runoff entering the watercourses will pass through a series of control measures in order to remove pollutants and to attenuate flows. These include:

a. Oil traps;
b. Interceptors;
c. Baffle boards;
d. Check dams;

e. Scum boards;
f. Vegetated swales;
g. Balancing Ponds; and
h. Penstocks.

8.7.19 A description of these control measures is included in the drainage strategy included as part of the FRA (Appendix 8.2)

8.7.20 The existing sewer system (storm or foul) will not be used for surface water drainage.

8.7.21 Mitigation will be undertaken to control the migration of chlorinated solvent contamination reaching Bowers Brook, to minimise impact to the Estuary. This will comprise of source reduction techniques; the existing drainage beneath Catalyst Trade Park area will be stopped up prior to the construction of the Widnes Loops Junction. Details of these are included in the Contamination of Soils, Sediments and Groundwater chapter (Chapter 14). The construction of the Widnes Loops Junction will be constructed using a grid of vibro-concrete columns to improve the ground.

8.7.22 Other techniques could be used to minimise the migration of chlorinated solvents entering Bowers Brook. These could include measures such as a physical barrier constructed in the ground between Catalyst Trade Park and Bowers Brook extending 4-5m below ground level.

Monitoring Requirements

8.7.23 Surface water quality monitoring will need to be undertaken to inform the decision making processes and action plans within the CEMP and EMP. This will help to ensure that any mitigation undertaken is successful in negating change to surface water quality within the watercourses included in this study.

8.7.24 Monitoring will be undertaken to accomplish the following:

a. Reporting requirements to statutory authorities regarding water management licenses;
b. Provision of information to the ‘action and response’ plans held within the CEMP; and
c. Provision of management information to monitor the scheme against Key Performance Indicators (KPIs).

8.7.25 Surface water quality monitoring will be undertaken in accordance with regulatory requirements and the planning permission for the scheme. Monitoring will be carried out at all of the watercourses where the scheme has the potential to impact on water quality.

8.7.26 Due to the amount of construction work within the Estuary samples will be taken on a monthly basis when intrusive works are being undertaken in the river (such as during the construction of the tower foundations). Once intrusive works in the river have been completed monitoring will be undertaken on a quarterly basis for the duration of the construction period. A period of post construction monitoring should also be undertaken, the duration of which should be agreed with the EA.

8.7.27 Stewards Brook, Bowers Brook, St Helens Canal will be monitored upstream and downstream of Project and, in the case of Bowers Brook, at the point where the brook discharges into the Estuary at Spike Island. These water courses will also be monitored on a quarterly basis with the frequency increasing to monthly monitoring during the period where intrusive works are occurring within and adjacent to the watercourse.

8.7.28 The remaining watercourses (Manchester Ship Canal, Bridgewater Canal, Latchford Canal, Halton Brook and Flood Brook) are to be monitored at locations above and below the Project. These will be undertaken four times a year on a quarterly basis for the construction period. Halton Brook will only be monitored if base flows of water are passing through it.

8.7.29 Classifications of water quality will be calculated using the EA GQA thresholds and heavy metal concentrations will be analysed against EA EQS thresholds once sufficient data allows. Exceedances of the monitored baseline water quality will trigger actions to identify, and if necessary mitigate, the decrease in water quality where this can be shown to be as a result of the Project. This process will be managed through the CEMP (construction phase) and EMP (operation phase).

8.7.30 The determinands to be tested as part of the monitoring scheme will be agreed with the EA.

8.7.31 The monitoring will form an integral part of the CEMP and EMP and is discussed in detail within chapter 23 of this ES.

8.7.32 Monitoring will be undertaken prior to works commencing to continue to develop the baseline and continue throughout construction. Post construction monitoring will continue for a period to be agreed with the Council and the EA.

8.7.33 It is recommended that monitoring is agreed between the EA, the Council and the Concessionaire and is secured by condition.

8.8 Residual Effects

8.8.1 Following the application of mitigation measures the significance of residual effects for the construction and operation effects are shown in Table 8.26.

8.8.2 Based on the mitigation and enhancements discussed in Table 8.26 the Project complies with the policies and legislation which is set out in section 8.4.

8.8.3 The Project complies with the WFD in the sense that the water quality of the watercourses will not be adversely affected as a result of the Project. Although the WFD requires all watercourses to be of 'good' quality by 2015 it is not the responsibility of the Project to improve the watercourses to this standard. This standard has also not been set at this time. It should however, ensure that existing water quality is not affected by the construction and operation of the Project. Likewise, the Cheshire Environmental Action Plan 2005-2020 states that their aim is to maintain high standards for watercourses and achieve at least 'Class C' GQA status by 2010. Many of the watercourses in the study area are currently at or below this grade. Again, the Project is not responsible for improving the water quality in these watercourses but will include measures to ensure that water quality is not adversely affected.

8.8.4 The Project will involve discharges of routine road runoff to controlled waters. This has been assessed as being not significant following the application of management and physical techniques to remove pollutants from the runoff prior to discharge into the receiving watercourses. A discharge application will need to be made to the EA to control the liquid emissions into watercourses. Therefore, the Project is compliant with the relevant parts Water Resources Act 1991, Environment Act 1995, Highways Act 1980, PPS23, RPG13 and the Halton UDP as listed in section 8.4.

8.8.5 The compliance with The Mersey Estuary Catchment Flood Management Plan and PPS23 is discussed in the FRA which is included in Appendix 8.2.

Table 8.26 - Assessment of Residual Effects

Effect	Receptor and importance	Nature of Effect (Permanent / Temporary and Magnitude)	Significance (High, Moderate, Low and Positive/Negative)	Mitigation & Enhancement Measures	Residual Significance (High, Moderate, Low and Positive Negative)
Construction Phase					
Extension of culverts	Water quality in Stewards Brook Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance	Management techniques should be used to mitigate effects on water quality within the brook. A water management plan and pollution control contingency plan should be prepared, particularly for works within watercourses. It will be necessary to ensure that materials within or adjacent to the brook do not enter the brook during construction so as to minimise any pollution incidents from sediments or contaminated materials. It will be necessary to over pump the brook to ensure that the working area is dry which will minimise pollution incidents.	Not Significant
	Water quality in Bowers Brook Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance	Management techniques should be used to mitigate effects on water quality within the brook. A water management plan and pollution control contingency plan should be prepared, particularly for works within watercourses. It will be necessary to ensure that	Not Significant

Effect	Receptor and importance	Nature of Effect (Permanent / Temporary and Magnitude)	Significance (High, Moderate, Low and Positive/Negative)	Mitigation & Enhancement Measures	Residual Significance (High, Moderate, Low and Positive Negative)
				materials within or adjacent to the brook do not enter the brook during construction so as to minimise any pollution incidents from sediments or contaminated materials. It will be necessary to over pump the brook to ensure that the working area is dry which will minimise pollution incidents.	
Accidental spillage of pollutants such as fuels, oils, concrete/cement, suspended solids from runoff etc.	Water quality in Stewards Brook Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance	Physical techniques will be employed to minimise the risk of accidental spillages during the construction phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in section 8.8.	Not Significant
	Water quality in Bowers Brook Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance	Physical techniques will be employed to minimise the risk of accidental spillages during the construction phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in section 8.8.	Not Significant
	Water quality in the St Helens Canal	Negative Short Term	Moderate Negative Significance	Physical techniques will be employed to minimise the risk of accidental	Not Significant

Effect	**Receptor and importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)	**Mitigation & Enhancement Measures**	**Residual Significance** (High, Moderate, Low and Positive Negative)
	Moderate Importance	Temporary Direct Moderate Magnitude		spillages during the construction phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in section 8.8.	
	Water quality in the Estuary Moderate Importance	Negative Short Term Temporary Direct High Magnitude	Moderate Negative Significance	Physical techniques will be employed to minimise the risk of accidental spillages during the construction phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in section 8.8.	Not Significant
	Water quality in the Latchford Canal Low Importance	Negative Short Term Temporary Direct Moderate Magnitude	Low Negative Significance	Physical techniques will be employed to minimise the risk of accidental spillages during the construction phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in section 8.8.	Not Significant
	Water quality in the Manchester Ship Canal	Negative Short Term Temporary	Low Negative Significance	Physical techniques will be employed to minimise the risk of accidental spillages during the construction	Not Significant

Effect	**Receptor and importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)	**Mitigation & Enhancement Measures**	**Residual Significance** (High, Moderate, Low and Positive Negative)
	Low Importance	Direct Moderate Magnitude		phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in section 8.8.	
	Water quality in the Bridgewater Canal Moderate Importance	Negative Short Term Temporary Direct Moderate Magnitude	Moderate Negative Significance	Physical techniques will be employed to minimise the risk of accidental spillages during the construction phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in section 8.8.	Not Significant
	Water quality in Flood Brook Moderate Importance	Negative Short Term Temporary Direct Moderate Magnitude	Moderate Negative Significance	Physical techniques will be employed to minimise the risk of accidental spillages during the construction phase. Environmental best practice should be used including the use of bunded fuel tanks, keeping stockpiles of contaminated materials and fuel tanks away from watercourses, use of spill mats and drip trays and other methods as suggested in section 8.8.	Not Significant
Mobilisation of chlorinated solvents into Bowers Brook as a result of the	Water quality in Bowers Brook Low Importance	Negative Short Term Temporary Direct	Low Negative Significance	Source reduction techniques should be employed to minimise the migration of chlorinated solvents toward Bowers Brook. Other	Not Significant

Effect	**Receptor and importance**	**Nature of Effect** (Permanent / Temporary and Magnitude)	**Significance** (High, Moderate, Low and Positive/Negative)	**Mitigation & Enhancement Measures**	**Residual Significance** (High, Moderate, Low and Positive Negative)
development on the Catalyst Trade Park site		Moderate Magnitude		techniques could be used such as the construction of a cut off wall to act a physical barrier.	
Mobilisation of Fines from Stone used to temporarily infill the St Helens Canal to allow construction plant to access the saltmarsh	Water quality in the St Helens Canal Moderate Importance	Negative Short Term Temporary Direct Moderate Magnitude	Moderate Negative Significance	Stone should be chemically inert (such as granite or shale) and pre-washed in a controlled location to minimise the release of fines into the St Helens Canal.	Not Significant
Increased sediment load in the water column from construction of a piled jetty and cofferdams in the Estuary	Water quality in the River Moderate Importance	Negative Short Term Temporary Direct Low Magnitude	Low Negative Significance	Management techniques should be used to mitigate effects on water quality within the river. A water management plan and pollution control contingency plan should be prepared, especially for works within the river. Physical techniques could include the use of silt nets to be used for piling operations.	Not Significant
Mobilisation of potentially contaminated sediments through scour action around the cofferdams.	Water quality in the River Moderate Importance	Negative Short Term Temporary Direct Low Magnitude	Low Negative Significance	Management techniques should be used to mitigate effects on water quality within the river. A water management plan and pollution control contingency plan should be prepared, especially for works within the river Physical techniques could include the use of silt nets to be used for piling	Not Significant

Effect	Receptor and importance	Nature of Effect (Permanent / Temporary and Magnitude)	Significance (High, Moderate, Low and Positive/Negative)	Mitigation & Enhancement Measures	Residual Significance (High, Moderate, Low and Positive Negative)
				operations.	
Operation Phase					
Routine runoff and spillage of chemicals from roads into surface water courses	Water quality in Stewards Brook Low Importance	Negative Short Term Temporary Direct Low Magnitude	Not Significant		
	Water quality in the St Helens Canal Moderate Importance	Negative Short Term Temporary Direct Low Magnitude	Low Negative Significance	Physical measures will be incorporated through control measures will be incorporated into the drainage design such as interceptors, oil traps, gulley pots and scum boards to remove contaminants from runoff. These will then pass into a balancing pond or a swale which will remove sediments before discharging into the receiving watercourse.	Not Significant
	Water quality in Flood Brook Moderate Importance	Negative Short Term Temporary Direct Low Magnitude	Low Negative Significance	Physical measures will be incorporated through control measures will be incorporated into the drainage design such as interceptors, oil traps, gulley pots and scum boards to remove contaminants from runoff. These will then pass into a balancing pond or a swale which will remove sediments before discharging into the receiving watercourse.	Not Significant

8.9 References

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